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Alberta Ethane Policy

Report on Implementation

April 1988

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Alberta Ethane Policy Report on Implementation

REPORT TO THE MINISTER OF ENERGY WITH
RESPECT TO AN INQUIRY HELD TO CONSULT
WITH THE INDUSTRY ON THE GOVERNMENT OF
ALBERTA'S ETHANE POLICY AND REPORT ON
ITS IMPLEMENTATION

April 1988

ALBERTA ETHANE POLICY
REPORT ON IMPLEMENTATION



Alberta Ethane Policy
Report on Implementation

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ABBREVIATIONS AND ACRONYMS USED IN THIS REPORT

10 ³	one thousand
10 ⁶	one million
AGE I & II	Alberta Gas Ethylene's First & Second Ethylene Plants
AGE III	Alberta Gas Ethylene's Proposed Third Ethylene Plant
AEGS	Alberta Ethane Gathering System
AGEC	Alberta Gas Ethylene Company Ltd.
Amoco	Amoco Canada Petroleum Company Ltd.
Anderson	Anderson Exploration Ltd.
ANG	Alberta Natural Gas Company Ltd
Board or ERCB	Energy Resources Conservation Board
bbl/d	barrels per day
Btu	British thermal unit
Canterra	Canterra Energy Ltd.
Cdn. Hunter	Canadian Hunter Exploration Ltd.
Celanese	Celanese Canada Inc.
CEMJV	Cochin Ethane Marketing Joint Venture
Chevron	Chevron Canada Resources Limited
C-I-L	C-I-L Inc.
Conoco	Conoco Canada Limited
Dome	Dome Petroleum Limited
Dow	Dow Chemical Canada Inc.
EDI	Ethylene Derivative Industry
EGLJV	Empress Gas Liquids Joint Venture
EOG	Ethane Owners Group
EOR	Enhanced Oil Recovery
Esso	Esso Resources Canada Limited
Gulf	Gulf Canada Resources Limited
Home	Home Oil Company Limited
IPAC	Independent Petroleum Association of Canada
m ³	cubic metres
m ³ /d	cubic metres per day
Mobil	Mobil Oil Canada, Ltd.
NGL	natural gas liquids
NOVA	NOVA, An Alberta Corporation
Novacor	Novacor Chemicals Ltd.
Norcen	Norcen Energy Resources Limited
PanCanadian	PanCanadian Petroleum Limited
Petro-Canada	Petro-Canada Inc.
Poco	Poco Petroleum Ltd.
Project	Alberta Ethane/Ethylene Petrochemical Project
Shell	Shell Canada Limited
SPO	Straddle Plant Owners
Sulpetro	Sulpetro Limited (now owned by Esso)
Texaco	Texaco Canada Resources
Union Carbide	Union Carbide Ethylene Oxide/Glycol Company

DEFINITIONS USED IN THIS REPORT

BTU VALUE	Heat value of a product measured for its energy content.
CYCLING	A method for producing a liquid-rich retrograde reservoir so as to maximize hydrocarbon recovery. The produced gas is processed to remove the natural gas liquids and the residue gas is reinjected into the reservoir to maintain the reservoir pressure.
DEBOTTLENECK	A term used for referring to improvements in production capability of a plant through fine tuning of components or piping.
DEEP-CUT	A term which refers to a plant which extracts ethane and heavier hydrocarbons from natural gas streams.
DOWLING LETTERS	Letters dated 17 and 19 September 1975 and 26 April and 11 May 1976 between The Honourable R. W. Dowling, then Minister of Business Development and Tourism, and the proponents of the Alberta Ethane/Ethylene Petrochemical Project (Dow, Dome, AGECE, and The Alberta Gas Trunk Line Company Limited, now NOVA).
DOWNSTREAM	A term referring to facilities which process or use gas and which are located on pipelines transporting gas to markets.
DOWNSTREAM PARTICIPANTS	The downstream participants at this inquiry included AGECE, ANG, CEMJV, EDI, and SPO.
ENHANCED OIL RECOVERY	Any method for enhancing oil recovery from a pool over what would be obtained through natural depletion (gas cap expansion, natural water influx, and solution gas drive).
ETHANE-PLUS	Mixture of natural gas liquids consisting of ethane and heavier hydrocarbons.
ETHANE-RICH	A term which refers to a gas stream or reserves containing a high concentration of ethane.
FIELD PLANT	A plant near the source of gas, which processes raw gas and is located upstream of pipelines which move the gas to markets. Some of these extract ethane.

FUEL VALUE	Value of a product based on its use as a fuel.
MISCIBLE FLOODS	A method for enhancing oil recovery where the reservoir is flooded with a miscible solvent, often natural gas liquids. The major part of the solvent will be reproduced over the remaining life of the pool.
NATURAL GAS LIQUIDS	A term referring to the heavier components recovered from processing natural gas. It generally includes propane, butanes, pentanes, and heavier hydrocarbons.
PLANCHE LETTERS	Letters dated 16 and 30 December 1985 between The Honourable H. L. Planche, then Minister of Economic Development, and the proponents of the Project.
POLICY STATEMENT	Alberta Government Policy on Ethane dated and released on 21 August 1987.
PURE ETHANE	Ethane which does not contain any natural gas liquids or other impurities.
SHRINKAGE COST (ETHANE)	Calculated value of ethane based on the natural gas equivalent of its energy content.
SPECIFICATION ETHANE	Ethane that is typically processed by Alberta petrochemical plants into ethylene. It contains approximately 94 per cent pure ethane.
STRADDLE PLANT	A reprocessing plant located on a pipeline. It extracts natural gas liquids from previously processed gas before such gas leaves or is consumed within the province.
TORONTO CITY GATE	A term previously used as a reference point for pricing oil and gas. Prices at this point do not include local distribution charges but include transportation costs to Toronto.
THRESHOLD VOLUME	A volume of ethane referred to in the Alberta Government Ethane Policy. It is to be made available to the straddle plant system for use by the Project. If measured at the inlet of the straddle system it is called the threshold inlet volume; if measured at the outlet of the straddle plant system it is referred to as the threshold output volume.
UPSTREAM	A term often used to refer to processing facilities located at the field near the source of the produced gas.

EXECUTIVE SUMMARY

An ethane policy was developed by the Government of Alberta in an effort to resolve an ongoing dispute between the gas producing industry and the Alberta Ethane/Ethylene Petrochemical Project (the Project). This world-scale project upgrades ethane from a component of natural gas typically consumed for its energy value to ethylene and ethylene derivatives.

The dispute is centred around the ownership of, or at least the right to extract ethane from, the gas produced in Alberta. The Project obtains its ethane feedstock largely from straddle plants, located on main gas transmission pipelines, that extract ethane and other hydrocarbon liquids before the gas is exported from the province or is used within the province. Much of the gas processed at the straddle plants has already been processed upstream at plants located in or near the gas fields to recover propane, butanes, and pentanes-plus.

Until recently, very little ethane was extracted at the field plants. But since the early 1980s, another demand for ethane in the province has created interest among gas producers in recovering ethane at field plants. This demand is for ethane to make up part of the solvent that is injected into oil reservoirs to increase oil recovery.

Since 1982, the ERCB has granted a number of approvals to extract ethane at field plants where the raw gas is comparatively ethane-rich. Almost every such application has been opposed by the Project on the basis that extraction in the field reduces the concentration of the ethane in the export gas available at the straddle plants and thereby increases the cost of the ethane that is extracted at the straddle plants. The field plant applications have been the subject of lengthy hearings which have enabled the ERCB to decide individual applications based on certain public interest criteria, but have done little to resolve the fundamental dispute between the parties.

In August 1987, the Alberta Government issued a policy statement that outlined its position respecting the extraction of ethane in the province. The policy established certain "rules" intended to ensure that both industries in the province that currently use ethane would have access to adequate and competitive sources of supply. The basis of the policy is the setting of a guaranteed "threshold volume" of ethane that could be extracted and supplied to the Project from its straddle plants.

Upon the announcement of the new policy, the Government requested the Board to consult with interested parties regarding several specific issues relating to the policy's implementation. Following an initial consultation, there was consensus between the parties that a public inquiry would be the appropriate forum for the Board to hear the views of all interested parties.

The Board convened the inquiry on 26 October 1987 to consider the following specific issues as requested by the Government:

1. the determination of the ethane facilities which should be affected by or be part of this policy;
2. the principles that should be used in determining the threshold volumes and the actual volumes thereby determined;
3. the determination of the procedures for requiring and the mechanism for ensuring reinjection or supply of ethane to the straddle plant system;
4. procedures that should be used for the expedient regulatory processing of applications for field ethane extraction facilities;
5. the existing and potential efficiency of ethane extraction at the straddle plants, the investment required to enhance extraction, and potential linkages with threshold volumes;
6. any legislative changes required to implement the policy; and
7. any other relevant matters.

Some 26 interested parties participated in the inquiry by presenting their views and/or questioning other participants. The positions of the participants on the six issues can be generally aligned into two sets of views, with variations of the basic positions put forth by some. The key issues where views were widely divergent related to whether the threshold volume should be defined at the inlet or output from the straddle plants, the magnitude of the threshold volume, and the terms of reinjection or supply of ethane to the Project to maintain the threshold volume.

The Project's position with respect to the threshold level was that it should assure the availability of sufficient ethane at the straddle plants to meet the requirements of the two existing ethylene plants as well as some volume for marketing until such time as it is needed to supply the Project's proposed third ethylene plant. The threshold volume recommended by the Project was defined in terms of the output from the straddle plants and was in the order of 21.5 to $23.9 \times 10^3 \text{ m}^3/\text{d}$ (135 to $150 \times 10^3 \text{ bbl/d}$) of specification ethane.

Gas producers argued that the provision in the policy for a threshold volume or guaranteed supply for the Project was unfair because it imposed an obligation on the gas industry for the benefit of the Project. If a threshold volume were to be implemented, however, producers generally recommended that it be limited to the maximum ethane feedstock needed to meet the initially-approved throughput rates of the Project's two ethylene plants. Some producers suggested that it be defined in terms of a gross inlet volume to the straddle plants. This would amount to some

$12 \times 10^3 \text{ m}^3/\text{d}$ ($75 \times 10^3 \text{ bbl/d}$) of straddle plant ethane output or $17 \times 10^3 \text{ m}^3/\text{d}$ ($107 \times 10^3 \text{ bbl/d}$) of inlet volume taking into account current straddle plant efficiency levels.

The gas producers also objected to the reference in the policy to the price that would be paid to field plant owners for ethane required to maintain the threshold volume for the Project and argued that the required transfer of ownership of ethane to the Project at a price set by the policy would be confiscatory.

The Project supported the price to be paid for any restored ethane volume as "the incremental cost of ethane extraction at the straddle plants" as described in the policy statement.

In formulating its recommendations respecting the policy, the Board reviewed the relevant letters exchanged between Project proponents and Government ministers in 1975, 1976, and 1985, and concluded that there were no specific volume or time-period commitments made by the Government respecting ethane supply to the Project. It therefore based its recommendations for implementation of the policy on measures it believes would best serve the Alberta public interest.

In its recommendations, the Board has proposed measures which it believes would be reasonably workable, fair to affected parties, and which would attempt to minimize the need for ongoing regulatory and Government involvement.

The Board's recommendations were influenced generally by its conclusion that the potential supply of ethane in the province is substantially higher than the expected Alberta demand. This conclusion is based on the Board's own forecast of the supply and demand situations over the next 20-year period.

The Board's main recommendations are listed below.

Facilities that should be part of policy

- The policy should provide protection only for the feedstock requirements of petrochemical plants which were approved and operating, or under construction at the time of announcement of the policy.
- Field plants recovering ethane which were approved and operating, or under construction at the time the policy was announced, should not be subject to the condition to supply ethane to support the threshold volume. If such plants undergo major expansion or if substantial new reserves are connected to them, the expansion or new reserves should be made subject to such a condition. New field plants recovering ethane should be subject to the condition. Exceptions would be where the lean residue gas is not destined to a stream which would be subsequently processed by a straddle plant.

The definition and setting of the threshold volumes

- The approximate debottlenecked capacity of the existing ethylene plants, $14.2 \times 10^3 \text{ m}^3/\text{d}$ ($89.3 \times 10^3 \text{ bbl/d}$) of pure ethane¹, should be protected as part of the threshold volume. Planned expansions to existing ethylene facilities and new facilities should not be included because the necessary investments have not as yet been made. The ethane marketing component of the Project should not be included in the threshold volume other than a minimum volume of $500 \text{ m}^3/\text{d}$ ($3 \times 10^3 \text{ bbl/d}$) of pure ethane for use as a buffer to move ethylene batches through the Cochin pipeline.
- The threshold volume should be expressed on the basis of ethane at the inlet of the straddle plants. Such a system would be administratively less complex and would encourage upgrading of the straddle plants because the increased recovery of the ethane available would increase supply and the increased supply would not be subject to the effects of additional upstreaming. The capacity of the existing ethylene plants and the required buffer volume, when adjusted for straddle plant recovery efficiencies, results in a threshold volume at the inlet of the Project straddle plants of $19.6 \times 10^3 \text{ m}^3/\text{d}$ ($123 \times 10^3 \text{ bbl/d}$) of pure ethane. This would be in addition to some $950 \text{ m}^3/\text{d}$ ($6 \times 10^3 \text{ bbl/d}$) committed to the Project from field plants.
- The protection for the two existing ethylene plants should be for the terms of the respective industrial development permits. Each of these was initially for 20 years. This would mean the full threshold volume of $19.6 \times 10^3 \text{ m}^3/\text{d}$ ($123 \times 10^3 \text{ bbl/d}$) would be provided until the end of 1998. The protection would then reduce to $10 \times 10^3 \text{ m}^3/\text{d}$ ($63 \times 10^3 \text{ bbl/d}$) through to the end of the year 2004.

Procedures for supplying ethane to the straddle plant system

- The Government should reconsider the position put forward in the policy statement that the price to be paid for field plant reinjected or directly-supplied ethane would equal the incremental cost of extracting the ethane at the straddle plants. As an alternative that would be more in the public interest, the price to be paid for such

1 Specification ethane is approximately 94 per cent ethane and therefore volumes expressed as specification ethane are some 6 per cent larger than when expressed as pure ethane.

ethane should be negotiated between buyer and seller. The relevant legislation should be changed to provide for a fair price to be set by a neutral third party in those situations where a price cannot be negotiated.

- For those plants which are required to provide ethane to the Project to maintain the threshold inlet volume, all of the Crown royalty ethane should be utilized first before any freehold royalty or working-interest ethane is subject to the requirement. Crown royalty ethane from those plants not subject to the requirement to supply the Project should not be affected by the policy. This would not preclude the Crown taking such royalty ethane in kind and providing it to the Project if it so desired.
- Supply of ethane to the Project should be by negotiation where feasible but would be ordered by the Board if negotiations for volumes to satisfy the threshold failed.

Procedures to be used for expedient processing of
field plant applications

- The Board would approve any ethane extraction application, without hearing or notice, if it were satisfied that conservation, social, and environment requirements were met, and if the scheme were in the public interest; and approval would be in accordance with the ethane policy.

1 INTRODUCTION

This report is in response to a request by the Government of Alberta that the Energy Resources Conservation Board (the Board or ERCB) consult with the industry regarding the Government's policy on ethane and report to it on a number of aspects of the implementation of the policy.

The report provides background to the request and identifies those who participated in the Board's public inquiry respecting the matter. It also briefly summarizes the positions taken by the various participants.

To assist the reader, Section 2 of the report describes the provincial ethane system and the roles played by the various parties, most of whom participated in the inquiry.

Section 3 gives the Board's projection of ethane supply and demand in Alberta over a future period of 20 years. These projections served as background to the Board's consideration of the various matters before it.

A brief discussion of the policy and the issues which the Board sees as relevant in its considerations is contained in Section 4 of the report, and the details of those considerations are set out in subsequent sections.

1.1 Background

On 21 August 1987, the Government issued a policy statement outlining its position respecting the production and use of Alberta ethane. (A copy of the policy statement is included in Appendix 1A.) The stated goal of the Government policy is

"...to maintain a functioning market in ethane wherein both the petroleum and petrochemical industries will have access to adequate and competitive sources of ethane supply and the incentive for further development of ethane-related activity in the province."

The policy was developed in response to a continuing conflict between gas producers and the Alberta ethane-based petrochemical industry regarding the right to extract ethane from natural gas in the province.

Ethane feedstock for ethylene production in Alberta is almost totally supplied from a small number of reprocessing plants (straddle plants) that extract natural gas liquids from gas previously processed and carried in main transmission pipelines before the bulk of it leaves the province and the remainder is consumed within the province. When the Alberta Ethane/Ethylene Petrochemical Project (the Project) was being planned in the early 1970s, the extraction of ethane at straddle plants

was considered by proponents to be the only feasible method of supplying the large volumes of ethane necessary to establish the contemplated world-scale ethylene plants. By the late 1970s ethane extraction capability at the straddle plants was being applied for and put in place to coincide with the start-up of the first ethylene plant. Gas producers were warning at that time that in future they might want to extract ethane at plants located in fields (field plants) upstream of the straddle plants.

In the early 1980s, a growing market for ethane-rich natural gas liquids (NGL) for use in miscible flood enhanced oil recovery (EOR) resulted in serious interest in ethane recovery at some field plants. Several field plants located upstream of the straddle plants have been applied for, approved, and built since 1981.

The Project has continuously opposed such applications for field ethane extraction on the basis that extraction in the field reduces the volume and concentration of ethane entering the straddle plants and thereby increases the cost of ethane feedstock output from the straddle plant system. Additionally, it has been argued that ethane extraction facilities upstream in the fields are largely duplicative of ethane extraction capability at the straddle plants; thus, there is little or no benefit to the province deriving from the field plants.

Proponents of field plants, generally gas producers, many of which are also oil producers interested in miscible-flood EOR, have argued that a mix of NGL, including ethane and heavier hydrocarbons (ethane-plus), produced at field plants is technically better suited and geographically better located to satisfy the demand for solvent used in hydrocarbon miscible flood operations.

In its assessment of individual applications to extract ethane in the field, the Board has used a number of criteria to determine whether or not approval of an application would be in the public interest. These criteria included the degree to which the proposed facilities would extract ethane incremental to the amount that could be extracted without the facilities, whether a market would exist for the ethane that could be extracted, the cost of supply of the ethane at a field plant compared with other supply sources, the impact on the straddle plant system and on the ethane-based petrochemical industry, the impact on the potential for EOR, the economic benefits to Alberta, proprietary rights, the degree of upgrading of resources within Alberta, and conservation and environmental considerations.

Applications to extract ethane in the field have typically resulted in lengthy public hearings before the Board where producers and the Project have argued details of cost/benefit analyses, supply and demand forecasts, and proprietary rights. Producers have been dissatisfied with the extensive information requirements common to these applications and

with the project delays caused by the hearing process. On the other hand, the Project has been dissatisfied with the need to oppose each application individually, and generally has been disappointed with the Board's ultimate decisions to approve most applications. To date, the Board has approved eight such applications and denied one. Four of the approved applications involved cycling schemes.

Since announcement of the policy, the Board has deferred two additional applications to extract ethane in the field pending implementation of the policy and has granted conditionally two other applications to extract ethane at gas cycling schemes.

As an alternative to resolve disputes between the producers and the Project over the right or authorization to extract ethane and the extraction location, the Board believed there was potential for negotiation of arrangements suitable to both the upstream and downstream interests. The Board encouraged such negotiation to the extent of making its approval of three applications in 1982 conditional on such negotiations taking place and encouraging future applicants to seek a negotiated settlement prior to seeking approval from the Board. In every case the negotiations failed or were only minimally successful.

1.2 Inquiry

On 21 August 1987, the Board received a copy of the Government policy statement under cover of a letter from The Honourable Dr. N. Webber, Minister of Energy. (Copies of the letter and policy statement are included in Appendix 1A.) In the letter, the Minister requested that the Board consider and report on the policy for protection of threshold volumes of ethane for the Project with specific reference to the following matters:

1. the determination of the ethane facilities which should be affected by or be part of this policy;
2. the principles that should be used in determining the threshold volumes and the actual volumes thereby determined;
3. the determination of the procedures for requiring and the mechanism for ensuring reinjection or supply of ethane to the straddle plant system;
4. procedures that should be used for the expedient regulatory processing of applications for field ethane extraction facilities;
5. the existing and potential efficiency of ethane extraction at the straddle plants, the investment required to enhance extraction, and potential linkages with threshold volumes;

6. any legislative changes required to implement the policy; and
7. any other relevant matters.

The Board notified interested parties of the policy statement and held a planning meeting on 1 September 1987 to determine the best way to allow affected parties' input to the Board's consideration of the policy. There was general agreement at the meeting that a public hearing process would be necessary to inquire into the matters raised by the Government. In its Memorandum of Decision dated 8 September 1987, the Board outlined the terms of reference for the inquiry to begin on 26 October 1987.

Prior to the start of the inquiry, the Board received submissions from 26 interested parties.

The inquiry commenced, as scheduled, on 26 October 1987, with G. J. DeSorcy, P.Eng. (Chairman), N. A. Strom, P.Eng., and F. J. Mink, P.Eng., sitting. A list of the registered participants is contained in Appendix 2 to this report. Appendix 3 contains a brief summary of the views of the participants.

The inquiry was in session a total of 20 days between 26 October and 14 December 1987. Written final arguments and responses were filed with the Board on 15 January and 22 January 1988, respectively.

2 PROVINCIAL ETHANE SYSTEM AND ROLE OF VARIOUS PARTIES

In Alberta, ethane is primarily recovered by extraction from natural gas streams at straddle plants and field plants. Crude oil refineries¹ are also sources but represent a relatively small portion of the total supply. Commercial ethane production from straddle and field plants is dependent on several factors, including the volume of natural gas processed, ethane content of the gas, and recovery level achievable by the type of plant.

Extracted ethane takes the form of either specification ethane² from major gas pipeline straddle plants and some field plants or the form of an ethane-plus mixture often including large proportions of propane and butanes from field facilities. The specification ethane is primarily used at ethylene manufacturing facilities while the ethane-plus is primarily used as a miscible flood solvent for EOR.

In 1987 Alberta produced some $20 \times 10^3 \text{ m}^3/\text{d}$ of specification ethane and approximately $8 \times 10^3 \text{ m}^3/\text{d}$ of ethane in the form of ethane-plus.

Figure 2-1 is a conceptual diagram of the network of ethane facilities in Alberta. Figure 2-2 is a map showing the locations of the facilities.

There are six straddle plants in Alberta, one at Cochrane, one at Ellerslie, and four at Empress as shown in Figure 2-2. The Cochrane plant which is owned by Alberta Natural Gas Company Ltd (ANG) processes gas that is primarily destined for export to the southwestern part of the United States (U.S.). The gas entering this plant tends to be fairly rich in ethane content. The design gas throughput capacity at the ANG plant is $31.2 \times 10^6 \text{ m}^3/\text{d}$.

The Ellerslie (South Edmonton) plant, owned by Dome Petroleum Limited (Dome) and ATCOR Resources Limited, is a smaller plant with design gas throughput capacity of $9.8 \times 10^6 \text{ m}^3/\text{d}$. It processes selected natural gas streams destined for use in the Edmonton area.

-
- 1 Ethane is technically available from oil sands upgrading operations. Such a source is not expected to be commercial in the near future and therefore is not dealt with in this report.
 - 2 Specification ethane contains approximately 94 per cent ethane. In this report ethane volumes are expressed in cubic metres of pure ethane, unless otherwise defined.

There are four straddle plants at Empress to process gas serving ex-Alberta markets to the east. These are Dome Empress I, owned by Dome and PanCanadian Petroleum Limited (PanCanadian), with a design gas throughput capacity of $41.5 \times 10^6 \text{ m}^3/\text{d}$; Dome Empress II, owned by Pan-Alberta Resources Inc. and TCPL Resources Ltd., with a design gas throughput capacity of $55.4 \times 10^6 \text{ m}^3/\text{d}$; the Petro-Canada Inc. (Petro-Canada) Empress plant, owned by Petro-Canada and PanCanadian, with a design gas throughput of $67.6 \times 10^6 \text{ m}^3/\text{d}$; and the Empress Gas Liquids Joint Venture (EGLJV) plant, owned by fifteen different entities, with a capacity for processing $9.9 \times 10^6 \text{ m}^3/\text{d}$ of natural gas. The combined gas throughput design capacity at Empress is therefore $174.3 \times 10^6 \text{ m}^3/\text{d}$. The gas entering these plants tends to be quite a lot leaner than that entering the ANG Cochrane plant.

Most of the ethane extracted at the straddle plants is dedicated to Alberta Gas Ethylene Company Ltd. (AGEC) for manufacturing of ethylene. Some ethane extracted at the EGLJV plant and at the Dome/ATCOR Ellerslie plant is contracted to other users.

There are also three field plants which produce specification ethane. These plants are located in the Waterton, Jumping Pound, and Turner Valley fields. The gas throughput capacities of these plants are 7.7, 5.2, and $0.6 \times 10^6 \text{ m}^3/\text{d}$, respectively.

Table 2-1 contains the design capacity specifications for the facilities which supply specification ethane to the Project. The ethane extracted at these plants is gathered and transported in the Alberta Ethane Gathering System (AEGS) which is operated by Dome. As illustrated in Figures 2-1 and 2-2, ethane from the straddle plants is transported to AGEC ethylene facilities at Joffre or onward to cavern storage facilities at Fort Saskatchewan. The storage facilities at Fort Saskatchewan currently dedicated to ethane are owned by Dome, Chevron Canada Resources Limited (Chevron), Procor Limited, and Dow Pipeline Limited; and together they have capacity to store up to $800 \times 10^3 \text{ m}^3$ ($5 \times 10^6 \text{ bbl}$) of ethane.

Ethane that is surplus to AGEC's feedstock requirements is marketed under the Cochin Ethane Marketing Joint Venture (CEMJV) agreement among Dome, Dow Chemical Canada Inc. (Dow), NOVA, an Alberta Corporation (NOVA), Petro-Canada, and Shell Canada Limited (Shell). The main market for this ethane originally was a fuel market in the U.S. Ethane was transported in the Cochin Pipeline to Sarnia, Ontario, where some was sold and to Greensprings, Ohio, the main market. The Cochin Pipeline runs from the cavern storage near Edmonton through Saskatchewan, connecting to pipelines to the U.S. midwest markets and ends at Sarnia, Ontario. Since the loss of the Greensprings contract in early 1986, CEMJV has had to seek other markets. Since 1985 it has marketed some specification ethane to miscible flood operations in Alberta. The latter is transported in the Federated Pipeline system from Fort Saskatchewan to oil fields in the Swan Hills area.

Ethylene manufactured at Joffre by AGECC is transported through AGECC's ethylene pipeline to storage at Fort Saskatchewan, to Alberta ethylene derivative manufacturers, or to Sarnia. Ethylene is batch-shipped to Sarnia in the Cochin pipeline with batches of ethane and other NGL products. Ethane is also used as a buffer to reduce contamination of the ethylene batches while in the pipeline.

Ethylene derivatives manufactured in Alberta include styrene, ethylene dichloride, vinyl chloride monomer, ethylene oxide, ethylene glycol, polyethylene, vinyl acetate, and linear higher olefins. The current major ethylene derivative manufacturers in Alberta are Dow, Union Carbide Ethylene Oxide/Glycol Company (Union Carbide), C-I-L Inc. (C-I-L), Celanese Canada Inc. (Celanese), Novacor Chemicals Ltd. (Novacor), and Shell.

Ethane-plus is extracted at a number of field plants, usually close to EOR schemes, in Alberta. There are six field plants currently extracting ethane-plus, another which is capable of producing specification ethane, and an additional plant under construction which will extract ethane-plus by 1989. The design capacities for gas and ethane of these facilities are tabulated in Table 2-2. These plants are sometimes referred to as deep-cut field plants and are not part of the Project.

A small straddle plant that is not part of the Project, the Norcen plant, is located at Fort Saskatchewan and produces ethane-plus. It has a throughput capacity of $1.0 \times 10^6 \text{ m}^3/\text{d}$ of natural gas. This plant extracts liquids from gas destined for use in the Edmonton area.

The ethane-plus from these field plants is currently injected as part of the solvent in EOR schemes. Ethane-plus is transported from various plants to miscible flood projects via the Peace Pipeline system, the Federated Pipeline system and the Amoco Pembina Pipeline system.

THE PROJECT

Specification Ethane Recovery Plants

STRADDLE PLANTS :

- Dome Empress I
- Dome Empress II
- Petro-Canada Empress
- EGL JV Empress
- Dome/ATCOR Ellerslie
- ANG Cochrane

FIELD PLANTS :

- Shell Waterton
- Shell Jumping Pound
- Western Decalta Diamond Valley

**STORAGE at
Fort Saskatchewan**

ETHYLENE
- AGEC I AND II

**STORAGE at
Fort Saskatchewan**

- Shell Canada
- Dow Chemical
- Union Carbide
- Celanese
- C-I-L
- Novacor Chemicals

ALBERTA ETHYLENE DERIVATIVES

- Styrene
- Vinyl Acetate
- EDC/VCM
- Ethylene Oxide/Glycol
- Polyethylene

NON-ALBERTA ETHYLENE
- U.S.
- Eastern Canada

NON-ALBERTA ETHANE
- U.S.
- Eastern Canada

NON-PROJECT

Ethane-plus Mix Producing Plants

STRADDLE PLANTS :

- Norcan
- Fort Saskatchewan

FIELD PLANTS :

- Texaco Bonnie Glen *
- Esso Judy Creek
- Canadian Hunter Elmworth
- Sulpetro Wapiti
- Dome Wembley
- Chevron Kaybob
- Ocelot PECO
- Chevron Brazeau **

**STORAGE at Plant Site
and Fort Saskatchewan**

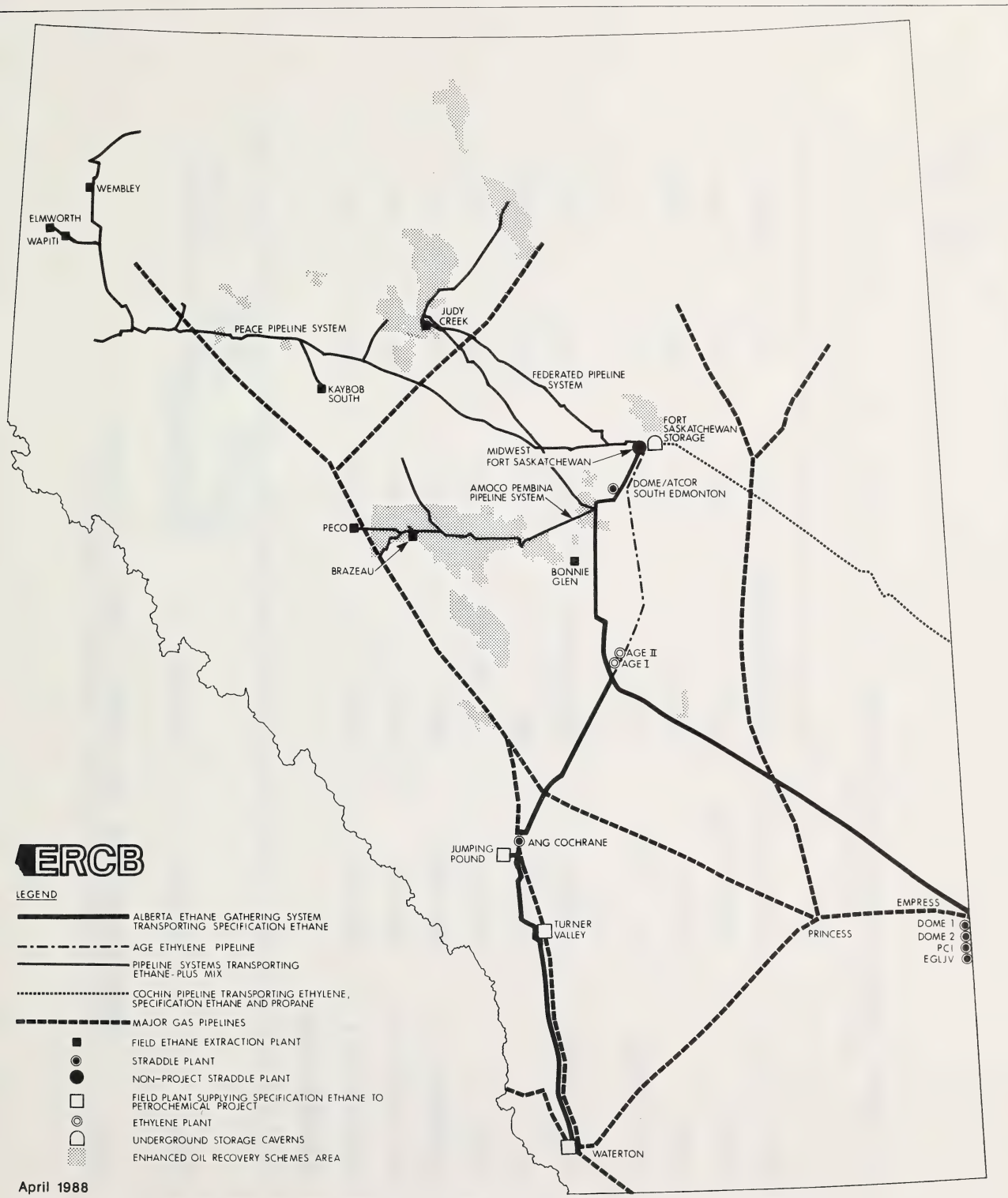
ENHANCED OIL RECOVERY

- Judy Creek
- Swan Hills
- Brazeau River
- West Pembina
- Fenn-Big Valley
- Caroline
- Willesden Green
- Leduc-Woodbend
- Acheson
- Redwater
- Antle Creek
- Kaybob South
- Simonette
- Mitsue
- Nipisi
- Rainbow

April 1988

* Can produce pure ethane

** Under construction at time of Inquiry



April 1988

FIGURE 2-2 ALBERTA ETHANE NETWORK

TABLE 2-1 ETHANE EXTRACTION FACILITIES CONTRACTED TO THE PROJECT
(ETHANE NUMBERS SHOWN ARE REPORTED IN TERMS OF PURE ETHANE)

NAME	LOCATION	OPERATOR	DESIGN CAPACITY		
			Gas Inlet (10 ³ m ³ /d)	Ethane Recovery (m ³ /d)	Ethane Content (%)
STRADDLE PLANTS					
Dome Empress I	Empress	Dome	41 500	2 703	5.15
Dome Empress II	Empress	Dome	55 400	5 287	3.83
Dome/ATCOR	Ellerslie	Dome	9 750	2 397	12.95
EGLJV	Empress	D. M. Wolcott ^a	9 860	1 113	4.15
ANG	Cochrane	ANG	31 150	6 592	7.18
Petro-Canada	Empress	Petro-Canada	67 620	5 079	3.95
FIELD PLANTS					
Shell	Waterton	Shell	7 748	911	5.08
Shell	Jumping Pound	Shell	5 212	431	3.88
Western Decalta	Diamond Valley	Western Decalta ^b	564	190	10.96

a D. M. Wolcott and Associates Ltd.

b Western Decalta Petroleum (1977) Limited.

TABLE 2-2 ETHANE EXTRACTION FACILITIES NOT CONTRACTED TO THE PROJECT
(ETHANE NUMBERS SHOWN ARE REPORTED IN TERMS OF PURE ETHANE)

NAME	LOCATION	OPERATOR	DESIGN CAPACITY		
			Gas Throughput (10 ³ m ³ /d)	Ethane in Ethane-plus (m ³ /d)	Ethane Content (%)
STRADDLE PLANTS					
Norcen	Fort Saskatchewan	Norcen	995	162	5.12
FIELD PLANTS					
Chevron	Kaybob South	Chevron	6 294	1 808	8.84
Chevron ^a	Brazeau	Chevron	667	322	13.96
Canadian Hunter	Elmworth	Canadian Hunter	7 748	1 752	7.15
Dome	Wembley	Dome	2 803	890	10.24
Esso	Judy Creek	Esso	3 800	2 915	28.00
Ocelot	Peco	Conoco	986	392	12.26
Sulpetro	Wapiti	Sulpetro	10 028	1 787	5.79
Texaco ^b	Bonnie Glen	Texaco	1 385	1 099	18.39

a Under construction at time of inquiry.

b Ethane can be produced as ethane-plus or pure ethane.

3 FORECAST ETHANE SUPPLY AND DEMAND

To aid in formulating a threshold volume system and to understand how it might be administered, the Board found it useful to have a reasonable picture of future ethane supply from Alberta natural gas and demand for ethane in the province. While some participants looked at the supplies potentially available, the Board's 20-year forecasts have been prepared on the strength of its own information only and would not necessarily be used in administering any future system for the maintenance of a threshold volume. If, as a result of the recommendations set out in this report, a system is implemented that would require periodic forecasting of supply and demand, the Board would likely request submissions from interested parties in order to have detailed information on which to base its forecast.

3.1 Supply

The Board's forecast of potential ethane supply over the next 20 years is shown on Figure 3-1. Several years of historical supply are also shown. It should be emphasized that the forecast is of a "potential" supply. The degree to which ethane will actually be supplied from the various gas streams will depend on the demand for ethane.

Potential supply from the straddle plant system is based on forecast gas throughputs at the Empress, Cochrane, and Edmonton facilities. These reflect the Board's views regarding the province's ultimate gas and oil reserves potential, future discovery rates, and future demand for Alberta gas.

The evidence presented at the inquiry clearly indicated that there is potential to improve ethane extraction efficiencies at some of the straddle plants. The Board believes that some efficiency increase at the straddle plant system will probably occur in the future, perhaps to coincide with a large increase in demand such as from the next ethylene plant, and has assumed a degree of this effect in its forecast of potential straddle plant supply.

In forecasting the potential supply, the Board has also assumed that implementation of the policy will not halt the construction of new upstream field plants. The Board believes this to be consistent with the policy statement. As well, the Board sees substantial potential for creating new ethane supply by extracting ethane at gas cycling schemes that would not have an upstreaming effect on the straddle plant system until the blowdown phase of the reservoir.

It will be noted from Figure 3-1 that the Board has used a broken line to divide forecast potential supply from the straddle plant and field systems. This is to reflect uncertainty as to which plants the volumes

would be recovered at and to emphasize that some volumes potentially supplied by field plants could be supplied by straddle plants, and vice versa.

The Board has also added as a third component to its forecast supply, ethane-rich gas reproduced from miscible flood EOR schemes. Here again, the degree to which this supply will be tapped will be largely dependent on the development of markets for the ethane. As well, the locations at which reproduced gas rich in ethane would be processed, ie. at upstream field or downstream straddle plants, will depend on a number of factors at the time the ethane-rich gas is being reproduced from the reservoir.

Figure 3-1 shows that the potential ethane supply could increase from the current level of about $24 \times 10^3 \text{ m}^3/\text{d}$ ($151 \times 10^3 \text{ bbl/d}$) to some $40 \times 10^3 \text{ m}^3/\text{d}$ ($252 \times 10^3 \text{ bbl/d}$) by the mid-1990s. It would then decline gradually for many years. Of course, the extent to which the ethane is actually supplied will depend on market demand. The portion which will be supplied by field plants, as opposed to straddle plants, is also uncertain, but the figure suggests it could grow to as much as one-third and then diminish with time.

3.2 Demand

The Board has prepared two demand cases shown on Figure 3-2. Several years of history are shown in addition to a 20-year forecast. For the low case shown on Figure 3-2, the Board has considered what is essentially a no-growth situation in demand for Alberta ethane. This case assumes that demand for ethylene manufactured in Alberta remains at about the 1987 level and neither debottlenecking of existing ethylene plants nor construction of a third ethylene plant occurs. The petrochemical demand includes a minimal amount of ethane to buffer ethylene shipments on the Cochin Pipeline system. This case also assumes that the demand for ethane for EOR solvent injection peaks in 1989 and declines quite rapidly thereafter.

The figure shows that for the low case, ethane demand would not grow much above the current levels of $24 \times 10^3 \text{ m}^3/\text{d}$ ($151 \times 10^3 \text{ bbl/d}$) and indeed would decline to about $18 \times 10^3 \text{ m}^3/\text{d}$ ($113 \times 10^3 \text{ bbl/d}$) and remain flat thereafter. The Board has included this no-growth case as an illustration of the very minimum ethane demand, though it generally believes it is overly pessimistic to expect such a situation.

The second demand case is higher and, in the Board's view, more realistic. This forecast assumes that demand for Alberta ethylene would warrant the debottlenecking of the two ethylene plants before 1990 as well as the construction of a third ethylene plant in the province by the early 1990s. For this more optimistic demand case, the Board has also forecast somewhat increased EOR activity by extending the peak requirement beyond 1989, assuming that availability of ethane could promote additional EOR use.

Figure 3-2 shows that ethane demand could grow to as much as $31 \times 10^3 \text{ m}^3/\text{d}$ ($195 \times 10^3 \text{ bbl/d}$) by 1993 and would then decline to about $27 \times 10^3 \text{ m}^3/\text{d}$ ($170 \times 10^3 \text{ bbl/d}$) by the late 1990s.

3.3 Comparison of Potential Supply to Demand

Figure 3-3 compares potential ethane supply to the forecast no-growth and realistic demand cases assuming no transportation constraints. On the basis of this comparison, the Board concludes that over the 20-year forecast period, sufficient ethane should be available from Alberta gas production to fully satisfy intra-Alberta requirements, including an expanded ethylene industry. Indeed, the forecasts suggest that enough ethane could be available to serve substantial extra-provincial markets if they were developed. This tends to confirm the views expressed by participants at the inquiry and by the Government in its policy statement.

The projections shown in these figures will be used by the Board as a background in its consideration of the matters before it.

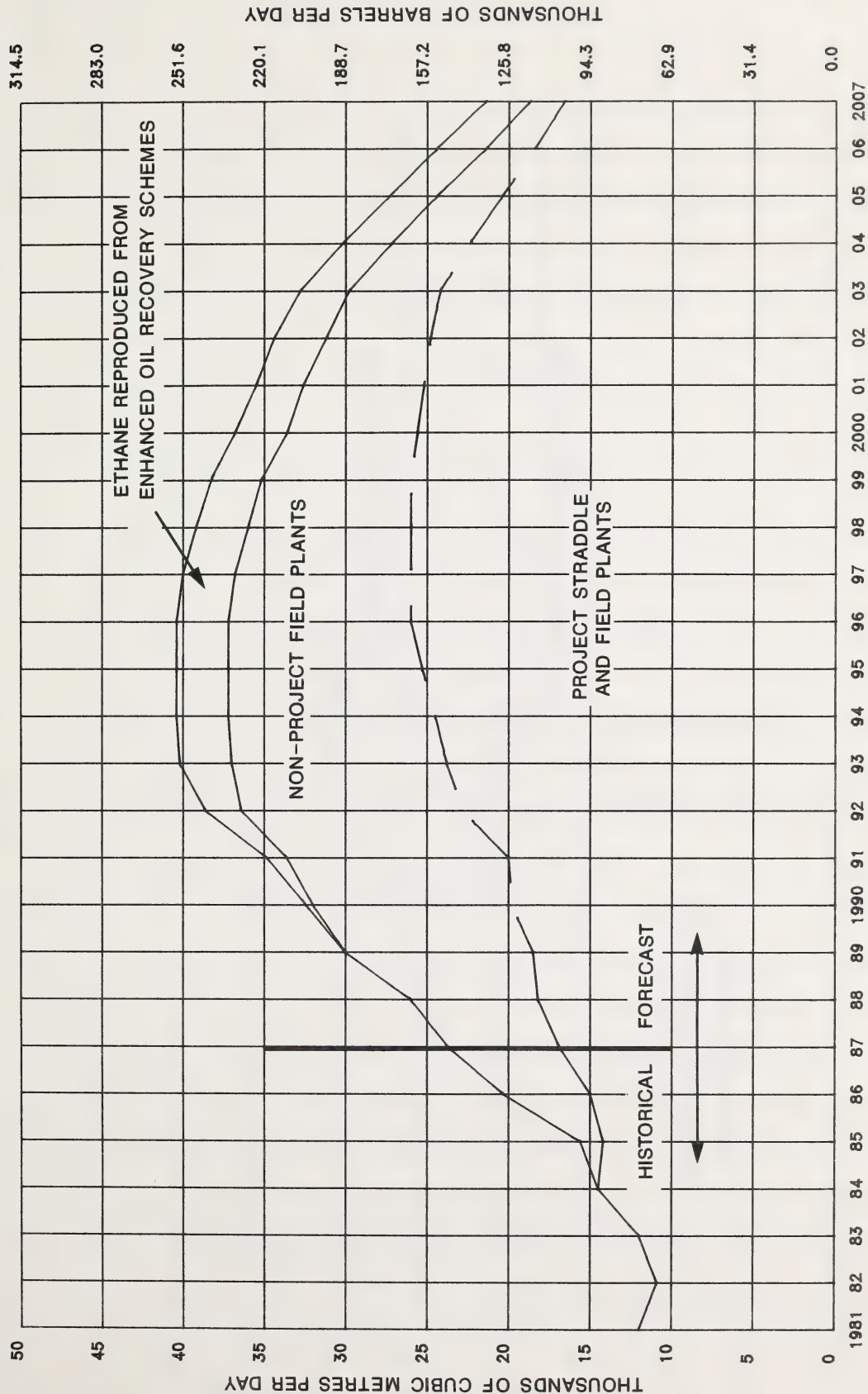


FIGURE 3-1 POTENTIAL ETHANE SUPPLY

D 88-D



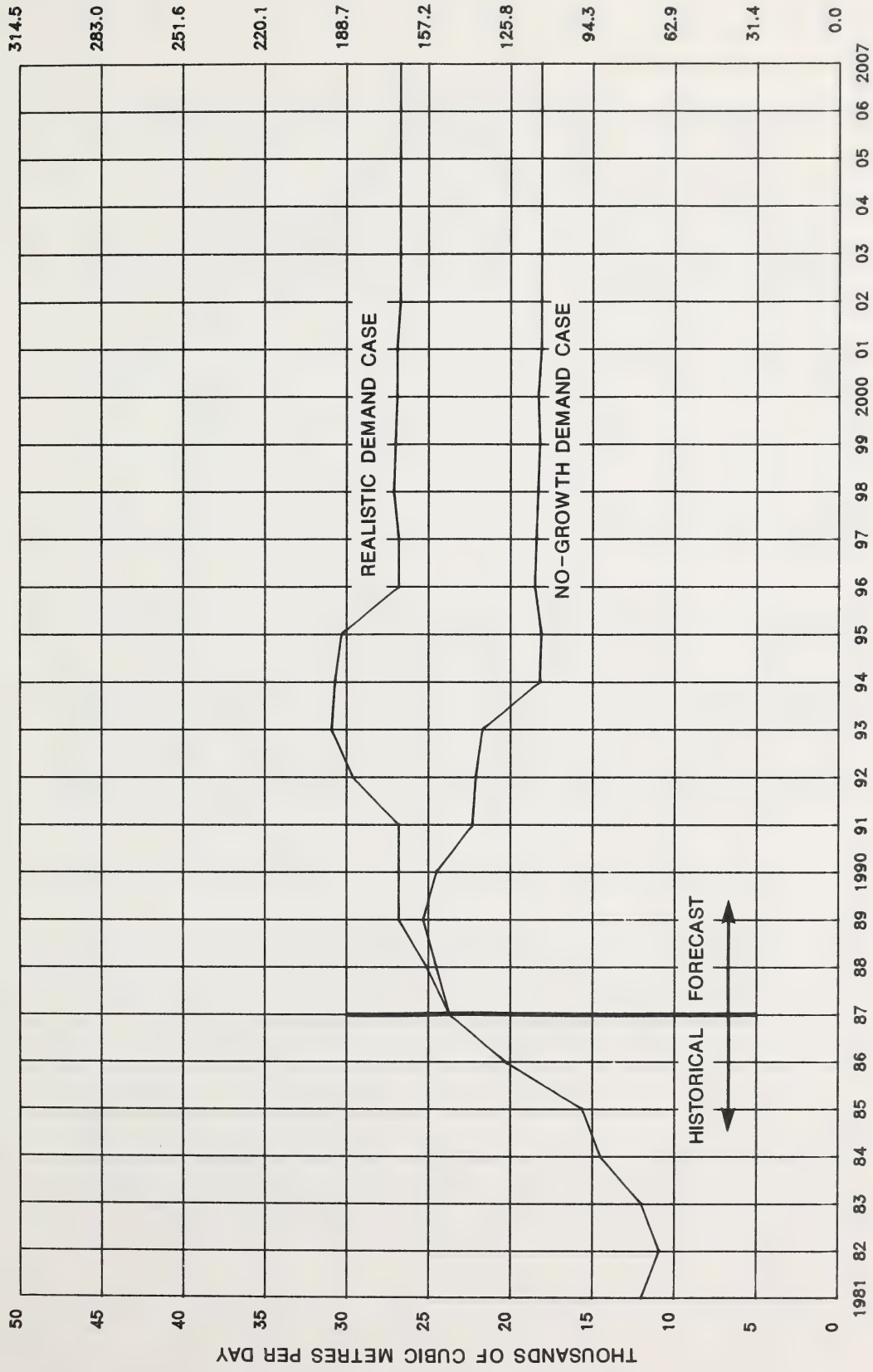


FIGURE 3-2 ETHANE DEMAND

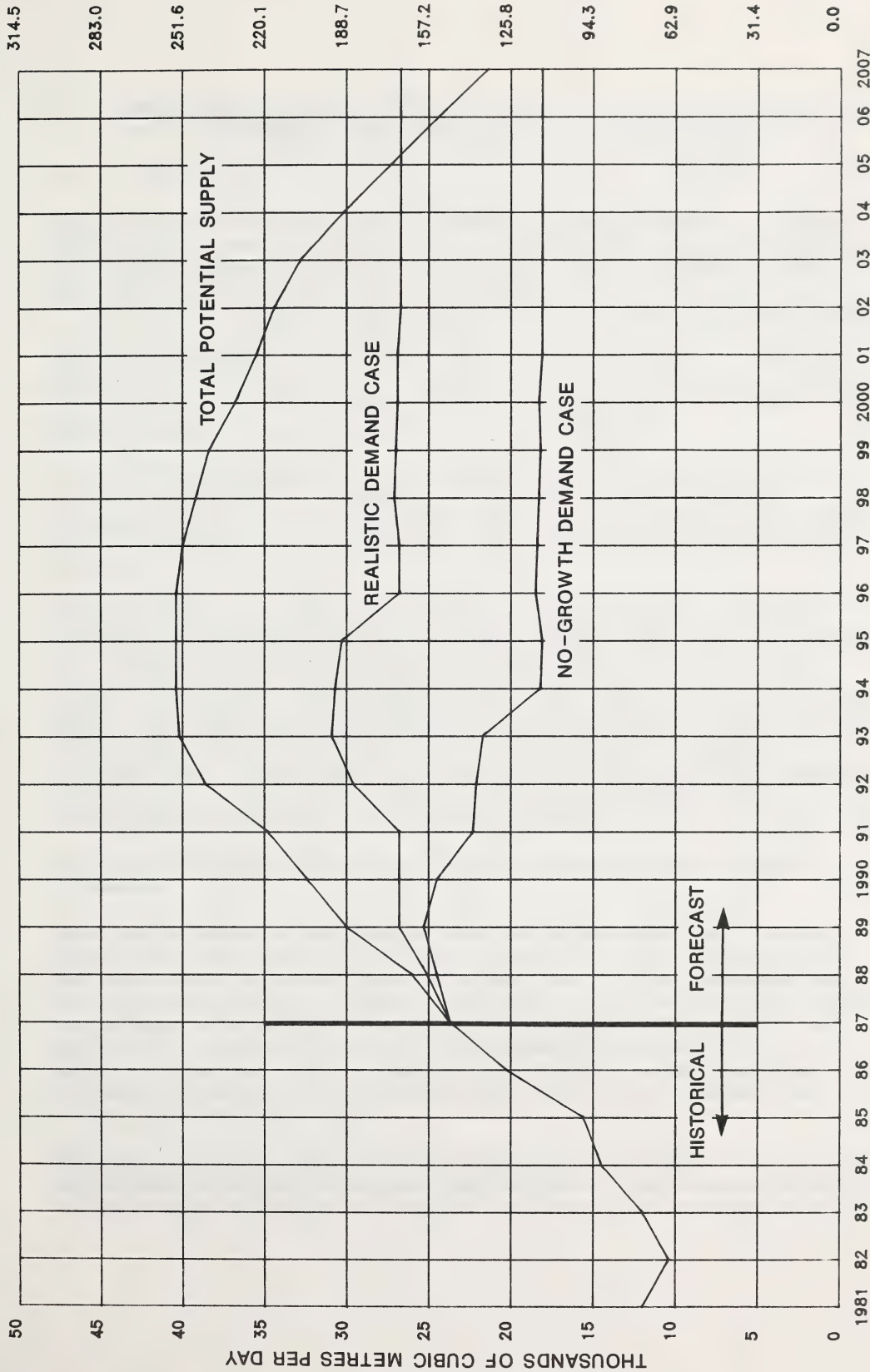


FIGURE 3-3 COMPARISON OF POTENTIAL SUPPLY TO DEMAND

4 THE ETHANE POLICY AND ISSUES TO BE CONSIDERED BY THE BOARD

4.1 Policy

The previously mentioned policy statement of the Government (21 August 1987) set out certain objectives for, and principles to be embodied in, a policy with respect to ethane. The letter of the same date from The Honourable Dr. N. Webber, Minister of Energy, to the Board indicated "...the need for further consultation with the industry and consideration of the policy, its implementation, and any amendments to the legislation required to implement the policy." It went on to request "...that the ERCB consider and report on the ethane policy, with particular reference to the following specific matters:....". It then identified seven matters related to the implementation of the policy.

The Board's interpretation of the request from the Minister, insofar as a review of the policy is concerned, is summarized in the following paragraph taken from its 8 September 1987 Memorandum of Decision arising out of a planning meeting respecting the implementation of the ethane policy.

"Although there were some requests for allowing the widest possible opportunity to speak to the policy itself, in the Board's interpretation, the Minister's request is not for a detailed review of the ethane policy and alternatives to it, but rather to have the Board focus on specific aspects pertaining to implementation as set out in his letter and listed above. Therefore, the Board intends to limit the scope of the inquiry to these specific matters and any other relevant matters respecting implementation. In the course of doing so, it will accept consideration of the policy to the extent that it bears on the practical matters of policy implementation as listed by the Minister."

The inquiry was conducted more or less in accordance with the above statement.

Those participants in the inquiry from the petrochemical and straddle plant side of the matter (the Project) generally took the position that the policy was a reasonable one and argued that "...the Government has finalized the policy...". On the other hand, those participants from the gas producer side of the matter generally took the position that the policy was "...wrong in principle and completely unnecessary for a variety of reasons." They argued that the Board's mandate included a consideration of the policy and urged the Board "...to consider and report on the policy itself."

The inquiry was not structured to provide a detailed review of the policy and it would therefore be improper for the Board to extensively advise the Government on the policy itself as opposed to its implementation.

The Board should make clear, however, that certain matters which might be considered basic elements of the policy could be affected by some of the Board's recommendations on implementation. Additionally, the Board considers it appropriate to comment from its perspective on the background to the policy statement and the need for a policy.

The Board has, on numerous occasions, made clear its views that the overall most efficient ethane extraction system for the province would include a combination of appropriately-located straddle and field plants. In the Board's judgement the blend of straddle and field plants should ideally be established on the basis of "commercial decisions". Under ideal circumstances regulatory involvement should be limited to that necessary to ensure that the facilities satisfy the public interest in terms of conservation and impacts on the community and environment. Where conflicts respecting commercial decisions occur, the Board strongly believes that negotiation towards mutually acceptable arrangements is the most suitable course of action.

Unfortunately efforts in this direction have not been successful, so the Board has been required to continue to exercise its jurisdiction and discharge its responsibilities as it interpreted them. This has meant providing notice of ethane extraction applications to parties that could be directly and adversely affected, and as appropriate, assessing whether such applications would provide for the economic, orderly, and efficient development in the public interest of the resources of the province.

The Board's method of assessing these applications over the past 7 years or so has had several less than satisfactory aspects. One of them is that the parties on both sides of the issue, the Project and the gas producers, face considerable uncertainty and do not know what the outcome of individual applications might be until they are assessed in detail and ruled on by the Board. The cost and time delays related to the processing of the applications have also been very substantial for all parties including the Board. Because of the shortcomings, the Board has over the years considered many possible "policy or system changes" which might improve the situation. Its objective was to seek an approach which would

- be workable,
- be fair to interested parties, and
- minimize the need for Government or regulatory intervention in what should normally be commercial decisions.

It has, quite frankly, failed to come up with any one approach which stood out with respect to all of these objectives.

The Board interprets the objectives of the Government as described in the 21 August 1987 policy statement to be similar to those expressed above.

On the basis of its knowledge of the industry and the evidence submitted at the inquiry, the Board believes the Government policy is a workable one, even though it may require a relatively complex administrative system to implement it.

When dealing with an issue as controversial and emotional as the ethane policy, it is not reasonable to expect all involved parties to see any one approach as totally fair. However, the Board believes that the policy announced by the Government can be implemented in a manner which attempts to recognize and balance the interests of the petrochemical and allied industries, the oil and gas industry, the Government's commitment to both industries, and the overall public interest.

The Board continues of the view that any special ethane policy should limit Government and regulatory intervention to only that which is necessary to ensure the public interest. To the extent possible the policy should also permit development decisions to be governed by commercial interests of the affected parties and resource values to be determined by the marketplace. The Board believes that both industries would see such an effort by the Government in a positive manner.

The Board is not aware of any system which would accomplish the objectives of the Government as set out in its policy statement without, to some extent, intervening in industry decision-making processes respecting the installation of ethane recovery facilities. It nevertheless believes that wherever reasonably possible, the implementation of the policy should be in a manner which minimizes intervention. This objective should be pursued even if it means modifying certain aspects of the policy as described in the August statement. Also, in the Board's view, any policy adopted should not remain in place indefinitely. Additionally, if at any time the key players in the matter can find common ground with respect to elements of the policy or its implementation, the Government should be prepared to change or cancel any system that may be created through the subject inquiry, this report, and subsequent Government action.

In summary, and having regard for the prevailing situation respecting ethane removal at field facilities upstream of straddle plants, the Board sees "a policy" as a temporary necessity to resolve an existing dispute between two industries of great importance to the province. It believes "the policy" enunciated by the Government can be made to work in a reasonably fair manner until the situation shifts to one where it is no longer needed.

4.2 Issues

The principal issues the Board must deal with in implementing the Government's directive are set out in the Minister's letter to the Board dated 21 August 1987. As indicated previously, some participants in the

inquiry suggested the policy itself should be at issue. The Board, however, stated that the scope would be limited to the specific matters set out by the Minister and other relevant matters respecting implementation of the policy.

In addressing these issues, essentially all of the participants used as a basis for their positions, their own interpretations of any specific commitments that may have been made by the Government to the Project.

In the 21 August 1987 policy statement the Government "...reaffirms its policy to ensure that ethane will be available for petrochemical use in Alberta". It also establishes a policy of ensuring that sufficient ethane, the so-called threshold volume, will continue to be available to the petrochemical industry. Since "the Project" is the only existing ethane-based petrochemical industry in the province, it is clear that the Government considers it does have a commitment to ensure ethane is available to the Project.

What is not clear is whether the commitment exists because of undertakings given by the Government when the Project was being initiated and whether such undertakings related to specific volumes or defined the time period over which the ethane would be available. The Board therefore believes a review of the relevant documents is a logical and necessary starting point from which to consider and provide advice on the implementation of the Government's policy.

Consequently, the first issue which will be addressed is

- whether or not the documents relating to the initiation of the Project reflect specific ethane volume or time-period commitments by the Government to the Project.

The further issues related to the details of implementing the policy are as follows:

- the determination of the ethane facilities which should be affected by or be part of this policy;
- the principles that should be used in determining the threshold volumes and the actual volumes thereby determined;
- the determination of the procedures for requiring and the mechanism for ensuring reinjection or supply of ethane to the straddle plant system;
- procedures that should be used for the expedient regulatory processing of applications for field ethane extraction facilities;

- the existing and potential efficiency of ethane extraction at the straddle plants, the investment required to enhance extraction and potential linkages with threshold volumes;
- any legislative changes required to implement the policy; and
- any other relevant matters.

5 **SPECIFIC COMMITMENTS BY THE GOVERNMENT RESPECTING
THE AVAILABILITY OF ETHANE TO THE ALBERTA ETHANE/
ETHYLENE PETROCHEMICAL PROJECT**

In addressing the matter of commitments by the Government to the Project it is important to make clear that the Board recognizes the overall commitment of the Government to the upgrading of resources within the province. This includes the very high level of upgrading including derivative manufacturing which takes place because of the existence of an Alberta petrochemical industry. The Board agrees with essentially all of the participants that such upgrading is in the province's best interest and is deserving of support. The issue being addressed in this section relates to the existence or otherwise of specific volume or time-period commitments respecting the assurance of long-term ethane feedstock for the Project.

Much of the discussion respecting commitments made by the Government to the Project related to the so-called "Dowling letters" exchanged between the proponents of the Project and The Honourable R. W. Dowling, then Minister of Business Development and Tourism, in September 1975 and April and May 1976. (Copies of these letters are included in Appendix 1B.) Reference was also made to the exchange of letters between the proponents and the Honourable H. Planche, then Minister of Economic Development, in December 1985. (These letters are included in Appendix 1C.) There was also much discussion regarding the Government policy statement dated 21 August 1987. All of these documents are included in Appendix 1. No other documents were filed by any of the participants at the inquiry that address this subject.

The 17 September 1975 letter to Mr. Dowling sets forth a series of intentions and undertakings by the proponents of the Project and requests certain commitments from the Government. The undertakings included the expansion or construction of straddle plants to remove ethane and of transportation and storage facilities to move the ethane to petrochemical markets within and beyond Alberta. There was a clear undertaking to build the first ethylene plant by a particular date, and reference is made to a second ethylene plant to be scheduled for completion as soon as practical after the first plant. The letter to Mr. Dowling also indicates "Additional ethylene plants timed to the additional requirements of the Alberta petrochemical industry, will be planned to consume the balance of the ethane supply...". The letter makes it clear that some ethane and ethylene would be marketed outside the province and describes conditions and undertakings related to the marketing, both within and beyond the provincial boundaries.

The letter requests confirmation by the Government relating to

- (a) a 10-year commitment to take any necessary action to maintain the economic competitiveness of the ethylene produced by the Project if the price of gas within Alberta were to exceed the British thermal unit (Btu) parity with Canadian crude oil at the Toronto City Gate,
- (b) the availability of adequate water supplies within reasonable distance of the ethylene plant sites, and
- (c) the extraction of ethane on reasonable terms from the gas now leaving Alberta.

The Minister's 19 September 1975 response stated "Based on the undertakings and intentions expressed in your letter, the Government approves the Project subject to your company's complying with all of the applicable provincial statutes and regulations, and obtaining the necessary approvals from provincial regulatory bodies." It also confirms the Government's position respecting the three matters, the first two of which do not, in the Board's judgement, bear substantially on the subject being dealt with in this report.

In dealing with the third matter, Mr. Dowling's letter stated

- "(c) The Government will take the appropriate steps to ensure that the ethane may be extracted on reasonable terms from the gas streams now leaving Alberta."

The petrochemical and straddle plant participants pointed to the references in the proponents' letter to two ethylene plants, possible additional plants, and the marketing of ethane and ethylene outside the province. They suggested that the Government's approval of the project, which was described in some detail in the original letter, coupled with clause (c) of the Dowling letter, could be translated to a specific commitment in terms of volumes of ethane. Their position generally was that Government approval of the Project meant a long-term commitment of sufficient volumes of ethane for the needs of the two ethylene plants and the marketing component, the latter to be satisfied until the third ethylene plant was built. They stated that clause (c) ensured, among other things, that producers would not be allowed to remove ethane upstream of the straddle plants, thus reducing ethane concentration and volumes available to the Project and jeopardizing its economic competitiveness.

On the other hand, the gas producers generally supported the view that clause (c) of Mr. Dowling's letter related to the need for the Project to make suitable arrangements with those owning the gas streams leaving the province and not to the extraction of ethane at field plants upstream of straddle plants. Several suggested that such a possibility was not

seriously contemplated in the mid-1970s by the Project. Their general view was that even if clause (c) did relate to "upstreaming", nothing in the Dowling letters would make the commitments specific in terms of volumes or the time period for which the commitment might apply.

The Board has carefully reviewed the Dowling letters and all other documents, having regard for the interpretations put forward at the inquiry. It has also had regard for its knowledge of the circumstances and views respecting the development of the Project and activity in all energy sectors that prevailed in Alberta and elsewhere in the mid-1970s when the letters were written. On the basis of its assessment, the Board is not convinced that clause (c) of the Minister's letter was intended to relate to the possible impact of upstreaming. In any case the Board does not believe that the Government's conditioned approval of the Project and the undertaking set out in clause (c) were intended to be a specific commitment of volumes of ethane to supply the three possible ethylene plants and the marketing component, even though they were referred to in the letters from the Project. Similarly, in the Board's view, Government approval of the cost of service arrangements would not necessarily mean a commitment that volumes of ethane would remain available to supply all of the facilities to which the cost of service arrangements apply.

The Project proponents in an April 1976 letter to Mr. Dowling set out amendments to their undertakings and sought clarification respecting the Government's position on one aspect of removal of gas from the province. Mr. Dowling's May 1976 response agrees with the amendments and the proponents' understanding of the gas removal matter, but does not alter the Board's view regarding the absence of a Government commitment for specific volumes of ethane. Similarly, the Board sees the exchange of correspondence in December 1985 only as a confirmation that Mr. Planche had no objections to certain changes to the earlier marketing undertakings by the Project. There is nothing in this correspondence to suggest to the Board a commitment to ensure specific volumes of ethane would be available for ex-Alberta marketing.

The Board's conclusion that the previously-mentioned documents were not intended to include a specific volume or term commitment is, in its judgement, consistent with the 21 August 1987 policy statement and the request of the Board to advise the Minister on details of implementation. Had the earlier documents been considered as commitments for specific volumes for specific time periods, it is unlikely the Government would have requested the Board's advice regarding the principles to be used in determining the threshold volumes. The Board does believe, however, that the Government may have given proponents of the Project the impression that it would generally assist them if their viability was threatened. The Board believes that the implementation of the proposed ethane policy is a mechanism for reinforcing that intent.

Having concluded that the documents do not give quantifiable direction on the specifics of the commitment to the Project, the Board believes it should rely on the direction given it in legislation as the basis for its considerations. This means the various matters referred to the Board by the Minister will be assessed from an overall Alberta public interest point of view.

Clearly an active growing petrochemical industry upgrading the province's energy resources will benefit the public interest, and likewise will a vibrant oil and gas industry which optimizes recovery of oil through EOR projects. The Board believes the existence of a competitive market for ethane would also serve the public interest and notes that the Government's policy is intended, in part, "...to maintain a functioning market in ethane wherein both the petroleum and petrochemical industry will have access to adequate and competitive sources of ethane supply...". A further element of the public interest, in the Board's view, would be a system where decisions to upgrade existing or construct new ethane extraction plants would be made on a "commercial basis" (subject to normal regulatory controls), and where impacts of various decisions on others would be dealt with through negotiation and appropriate agreements.

The above-mentioned elements of the public interest, and all others, must be considered by the Board in formulating its advice to the Government.

Although this section of the report is intended to deal with any specific commitments the Government may have made to the Project, the Board believes it appropriate to comment on one additional matter. This is that the Board itself has at no time made a commitment to the Project that removal of ethane upstream of its facilities would not be allowed. To the contrary, it alerted Project participants as early as 1976 in ERCB Decision 76-2 respecting the Ellerslie straddle plant application that upstreaming might occur. The following passage is taken from page 12 of that report.

"A lower than projected ethane recovery is also possible having regard for the Board's position that an approval of the applied-for facilities would not preclude the subsequent approval by the Board and the installation of ethane recovery facilities in field locations upstream of the plant. Such possibility is, in the Board's view, a business risk which the applicant would have to contend with."

Statements of this nature were repeated in several decisions of the Board over the years since 1976.

6 THE DETERMINATION OF THE ETHANE FACILITIES WHICH SHOULD BE AFFECTED BY OR BE PART OF THIS POLICY

6.1 Views of the Participants

6.1.1 Petrochemical Project

AGEC, the Ethylene Derivative Industry (EDI), and Empress/Ellerslie Straddle Plant Owners (SPO) submitted that the existing ethylene manufacturing facilities, AGE I and II, should be protected in terms of required ethane feedstock and in addition, AGE III should be protected when it is built.

All downstream participants stated that ethane marketing is an integral part of the Project and volumes for that purpose should be protected by the policy.

Project participants also indicated that the existing straddle system capacity should be recognized in establishing the policy. In addition, these participants argued that ethane extraction capacity added to the straddle plant system by the construction of new plants or improvement in the recovery efficiency should be recognized and protected.

With respect to field facilities, the Project indicated that the existing field plants within their existing licence limitations should be exempt from the policy. These plants are already in place with approved capacity, recovery factor, and sources of natural gas, and therefore should not be subject to the supply or reinjection of ethane into the gas stream to maintain the threshold volume. However, all new field plants which would move lean gas into the provincial gas collection system should be subject to the policy.

Those downstream participants who addressed the non-upstreaming field plants stated that these plants should be exempt from the policy but only during any period that lean residue gas from these plants does not enter the provincial gas collection system and thus not affect the amount of ethane available at the straddle plants.

With respect to the duration of protection provided by the policy, AGEC indicated it should last for the duration of the particular facility or, as a minimum, the contract life which is 20 years. SPO and ANG stated that there should not be an expiry date on the protection policy. ANG, however, indicated that a periodic review of the policy should be required.

6.1.2 Gas Producers

There was general agreement among the gas producers that non-upstreaming field plants, both existing and new, should be exempt from the policy and that, if there must be a policy, all new upstreaming plants should be subject to it.

The Ethane Owners Group (EOG) recommended that the policy, if it were adopted, apply to all existing and new field plants except those involving gas cycling, but be limited to a maximum period of 5 years and limited to meet the need of the AGE I and II plants only. It indicated that all AGE C ethane supply facilities including straddle plants, transportation, storage, injection, removal, and treating facilities would be affected by the policy.

The Independent Petroleum Association of Canada (IPAC) supported EOG in recommending exclusion from the policy of any facilities pertaining to ethane and ethylene removal from the province. Other gas producers did not make specific recommendations respecting downstream facilities except that there was general agreement that the policy should not protect the ethane supply for debottlenecking or expansions of AGE I and II or a third ethylene plant.

Opinion was divided, however, respecting existing upstreaming plants. EOG indicated that if its recommended threshold volume were accepted, the need to exempt any field facilities from the policy could be avoided by using the royalty share of production from all field ethane facilities, existing or new, to meet the threshold volume. One member of EOG, Chevron, specifically advocated grandfathering existing plants if compulsory transfers of ethane became necessary to meet threshold deficiencies. The latter would occur only if royalty ethane and freely negotiated ethane sales between producers and AGE C proved to be inadequate. Amoco Canada Petroleum Company Ltd. (Amoco) and IPAC asked that existing upstreaming plants be grandfathered and hence be exempt from having to reinject or supply ethane to the straddle plant system because they were constructed without knowledge of the policy.

6.2 Findings and Recommendations of the Board

This issue as set out in the policy statement refers to the facilities "...which should be affected by or be part of this policy." It is important to note that if the policy proceeds and for at least the period of its existence, all ethane- or ethylene-related facilities in the province will likely "be affected", either directly or indirectly. For this reason the Board is focusing its attention on those facilities that will directly be part of the policy or its administration.

Such facilities fall into two categories. One is the downstream facilities that produce or consume ethane and which need be considered in setting the appropriate threshold volume. The other is the upstream field plants which would be required to operate in a manner that ensures the downstream availability of the threshold volume.

As is the case with all of the issues set out in the policy statement, the Board believes it must have regard for the overall public interest in determining what facilities should be part of the policy. Of paramount

importance in this regard is a philosophy that facilities which have passed regulatory tests, have been approved, and are constructed or under construction should not have terms of the approval arbitrarily changed unless the public interest demands such changes. Investments related to existing facilities were made in the face of many risks but preferably they should not include possible impacts of a new policy such as that of the Government respecting ethane. On the other hand, once the policy is in place, decisions to invest capital in future expansions of existing facilities or the construction of new ones will be made with full knowledge of the Government's policy and intentions and the related risks.

Having this approach in mind, the Board believes that the downstream facilities that should play the key role in terms of the policy are AGECE's two existing ethylene plants. The existing derivative plants and other markets being supplied with the ethylene from those two plants will thus be affected by the policy. Also, the straddle plants and field plants whose ethane is currently contracted to AGECE will clearly be affected. The same is true, to varying degrees, for a number of other existing facilities such as the Cochin Pipeline, the AEGS, and ethane storage facilities.

Upstream facilities that should be part of the policy are those specific field plants that may be built in future and would be required to ensure that the threshold volume of ethane is available to downstream users. For the reasons expressed earlier, the Board believes that only field plants approved and built following the announcement of the policy should be part of it. To elaborate, it is sometimes necessary to retroactively apply new rules or regulations to existing energy facilities for conservation, safety, or environment reasons. However, the Board sees no compelling reason in this case to impose additional requirements on existing approvals.

There are frequently situations where changes to an approval for an existing plant are initiated by an approval-holder to increase plant capacity or allow processing of gas from new sources. Where this occurs and the changes are significant in the view of the Board, the ethane production from the expansion or new source of gas reserves should be made subject to the policy, unless the operator demonstrates that such was unreasonable or impractical.

The Board is of the view that plants, whether existing or new, whose residue gas is not available for reprocessing by the straddle plant system should not be a part of this policy, at least for as long as that mode of operation prevails.

7 THE PRINCIPLES THAT SHOULD BE USED IN DETERMINING THE THRESHOLD VOLUMES AND THE ACTUAL VOLUMES THEREBY DETERMINED

7.1 Views of the Participants

7.1.1 Petrochemical Project

Most downstream participants submitted that in the Dowling letters, the Government made a commitment to the Project to provide sufficient ethane on reasonable terms for ethylene manufacturing in the province. They held that principles in determining the threshold volume should therefore consider this commitment. They suggested that the key criteria in determining the threshold level is a stable long-term ethane supply and price for the petrochemical industry to maintain its economic competitiveness.

AGEC, EDI, and SPO indicated that the threshold volume should be set at a level where the requirements of AGE I and II at their debottlenecked capacity are met. It should also meet the requirements of the previously-approved third ethylene plant when that plant is built. ANG, however, indicated that the threshold volume should be flexible but designed to meet the petrochemical needs. SPO argued that the threshold volume should be set equivalent to the existing capacity of their plants to extract ethane and that further upstreaming should not be allowed.

Except for ANG who did not make any comment, all downstream participants also argued that the ethane marketing component of the project should be provided for in the threshold volume until the third ethylene plant is commissioned. Further, they recommended that the threshold volume should include provision for the Cochin Pipeline buffer requirement for shipments of ethylene through that pipeline.

The downstream participants tied their definition of threshold volume to straddle plant output rather than inlet ethane available and indicated that the threshold output volume should be increased in future to recognize any expansion to the straddle system either through addition of new plants or increases in efficiency of the existing facilities.

AGEC recommended that the threshold output volume be set initially at $21.5 \times 10^3 \text{ m}^3/\text{d}$ ($135 \times 10^3 \text{ bbl/d}$) and later, when AGE III is commissioned, be increased to $23.9 \times 10^3 \text{ m}^3/\text{d}$ ($150 \times 10^3 \text{ bbl/d}$). Except for ANG, the downstream interests argued that the threshold volume should remain fixed and not be related to swings in the levels of usage by the Project.

7.1.2 Gas Producers

According to EOG's interpretation of the Dowling letters, no specific ethane supply volume commitment was ever made to the two existing ethylene plants by the Alberta Government. Notwithstanding this, and though it contended that the threshold volume should be set at zero, EOG stated a preparedness to accept a threshold volume applicable for 5 years equal to the ethane requirements of AGE I and II prior to debottlenecking. This would amount to some $11.9 \times 10^3 \text{ m}^3/\text{d}$ ($75 \times 10^3 \text{ bbl/d}$), subject to certain adjustments.

Chevron pointed out that if the Government interprets a commitment in the Dowling letters, then that commitment should be limited to the Project as envisaged at that time, namely to the AGE I and II plants only. Chevron determined this to be about $11.8 \times 10^3 \text{ m}^3/\text{d}$ ($74.4 \times 10^3 \text{ bbl/d}$) of pure ethane.

EOG suggested that the threshold volume should be defined in terms of output at the straddle plants. Also there should be no protection in the threshold volume for expansion of ethylene manufacturing, for ethane marketing, or for expanded straddle plant capacity. EOG also argued there should be no increase in threshold volume to match plant efficiency improvements. However, IPAC and Shell considered it reasonable to include some sort of incentive in the administration of the threshold volume for such improvements.

IPAC proposed applying an efficiency differential factor to the current AGE I and II requirements less any exported ethylene volumes to determine the net threshold output volume. This factor would be calculated by finding the difference in residual ethane in the outlet streams between the older and the newer plants. Thus any efficiency improvements would lower this differential. In addition, it proposed a separate efficiency improvement factor which would allow increases in the threshold volume to a maximum equal to the current AGE I and II requirements.

Shell argued that incentives for efficiency improvement could be achieved by setting threshold volumes at the inlet of the straddle plants and permitting operators to implement improvements where commercial circumstances warranted such a move. Chevron also agreed that the threshold volume should be set at the straddle plant inlet and this would permit SPO to recover every cubic metre of ethane resulting from efficiency improvements.

Other areas of general agreement among the producers included estimating threshold and supply volumes on an annual basis, an overall maximum policy life of 5 years, and a return to a free market environment in both feedstock supply and product sales in as short a timeframe as possible. Shell suggested that the policy should phase out over a reasonable period of time. EOG emphasized that the policy should apply only to the

lowering of ethane content due to upstreaming, and that risks of reduced ethane availability caused by low gas flows or natural lower field ethane content should be assumed by the Project.

With respect to the size of the threshold output volume, there were some minor deviations from the positions given earlier regarding the AGE I and II plants. Chevron advocated the lesser of the design requirements or the actual ethane consumption of AGE I and II. EOG, Shell, and IPAC said the threshold output volume should not include volumes of ethane or ethane equivalent in the form of ethylene removed from the province.

7.2 Findings and Recommendations of the Board

The Board is of the view that the level at which the threshold volume is set will, to a large extent, determine the fundamental fairness of the policy. It was clear from the submissions to the inquiry that the Project favours a high threshold output volume, in the order of 21.5 to 23.9 x 10³ m³/d (135 to 150 x 10³ bbl/d) to assure the ultimate feedstock requirements of an expanded Project and preserve the present feedstock cost structure. Gas producers, on the other hand, were largely in favour of a threshold output volume of zero but stated they were willing to compromise their perceived rights to the extent of maintaining for a limited period a threshold output volume of about 11.9 x 10³ m³/d (75 x 10³ bbl/d).

From the Board's perspective, its decision regarding a threshold output volume to recommend to the Government must be based on the level that will best serve the public interest of Alberta. It would not appear to the Board to be in the public interest to adopt a threshold output volume that is so high that it would prohibit the construction of new field plants that might be used to supply ethane to the EOR market. Indeed, it would seem contrary to the policy itself to adopt such a threshold volume.

Similarly, however, it would not be in the public interest to allow the straddle system supply to be eroded by upstreaming to the extent that sufficient ethane would not be available to serve those petrochemical plants already approved and constructed. This, too, would be contrary, in the Board's view, to the intent of the policy.

7.2.1 Principles

The first principle the Board believes should be used in determining the threshold volume would be to ensure ethane feedstock to the existing ethylene plants for a reasonable time period. This in turn would ensure that ethylene is available for the existing derivative plants. All of these plants were invested in by companies that apparently believed they had some form of feedstock assurance. This is not so with the planned third ethylene plant because, although approved, actual construction

has not yet proceeded. The question of whether or not to recommend a threshold level which would provide for a third ethylene plant is an extremely important one. Evidence from the Project participants suggested that if AGE III were not provided for in the threshold volume, construction of that facility would not proceed. The gas producers, on the other hand, opposed inclusion of requirements for a third plant in the threshold volume and suggested that if the plant proceeded it should have to compete in the marketplace for its ethane feedstock supply. They also suggested that a third plant may well be sponsored by other than the Project participants.

As the Board sees it, the major advantage of including provision for AGE III in the threshold volume is that it would increase the likelihood that the plant would proceed in the near term as approved. A distinct disadvantage, however, would be pre-empting a supply of ethane to provide feedstock for a facility on which the investment funds had not yet been expended. To set aside volumes for a third plant would thus be contrary to the philosophy set out by the Board in Section 6.2 that facilities approved and constructed or under construction prior to the date of the policy announcement are those which require special recognition as part of the policy, while those facilities for which investments have not yet been made should not be given special treatment. It would also be contrary to the objective of the policy that it should minimize regulatory intervention in what should normally be a commercial decision.

Additionally, the Board is not convinced that a third ethane-based ethylene plant could not proceed in Alberta at some future time if it is not protected for in the threshold volume. In any case, the Board believes it would be in the public interest if the proponents of such a plant, regardless of whether they were part of the existing Project or not, negotiated with potential producers and contracted for the needed feedstock before the plant was built.

In further considering the question of a third plant, the Board does not believe that the policy was intended to do anything other than discharge earlier commitments which had been made or were understood to have been made to proponents of a project, which in turn resulted in investments being made. Since the third plant has not yet been built, there is an opportunity for the Government to clarify whether or not it wishes to make a commitment to that part of the Project. If one is made, whether it be in the form of a guaranteed supply or otherwise, the Board would see merit in that being negotiated and specifically agreed to before the further investment is made and the plant proceeds. If a form of support is so negotiated the Board also believes that it should be specifically identified as, and take the form of, Government support for the Project.

Having regard for all of these considerations and notwithstanding that exclusion of AGE III requirements from the threshold volume could very well represent a short-term setback to the petrochemical industry in the province, the Board has concluded that the potential requirements of the third plant should not be included in the threshold volume.

Some gas producers contended that the capacity of existing ethylene or derivative plants should not be provided for to the extent that the manufactured ethylene or derivatives are marketed outside Alberta. The Board believes that any significant petrochemical industry within Alberta will have to rely to considerable extent on markets outside the province. Consequently, the Board would not discount the volumes protected for the existing industry to reflect products marketed ex-Alberta.

There was considerable discussion at the inquiry about whether or not the ethane volumes used by the ethane marketing component of the Project should be included in the threshold volume. While the Board appreciates that income from sales of these volumes may help to cushion the cost structure of ethane feedstock and hence ethylene, it considers this to result primarily from the pricing arrangements and risk-sharing put in place for the benefit of the Project participants. The mere existence of such arrangements does not, by itself, justify recognition of them in setting the threshold volume. In fact, inclusion of such volumes in the threshold volume would probably ensure continuance of the pricing arrangements whether or not such would be in the Alberta public interest.

With respect to the inclusion or otherwise of the ethane marketing component in the threshold volume, the Board is mindful of the evidence suggesting that the Project could not have proceeded without the ethane marketing system. It is conjectural as to whether or not this is so. The Board believes that parts of the marketing system may have proceeded in any case. Its purpose would have been to market NGL other than ethane as well as any ethane recovered in Alberta and not needed for petrochemical purposes, the only real use at the time the Project was instituted.

Additionally, if the marketing component is included in the threshold volume, it would tend to concentrate ethane marketing in the hands of participants in the Project. This would dilute the chances of ensuring a "functioning" market for ethane, one of the objectives of the Government's policy. Also, it could interfere significantly with the ability of gas producers to supply the right type of hydrocarbon solvent for EOR purposes and to compete to sell ethane to those same markets pursued by the Project.

Therefore, as a further principle, the Board believes it would be unfair to include the ethane volumes of the Project marketing component in the threshold volume.

The evidence supplied at the inquiry shows that the development of the original Project contemplated the movement of ethylene to Dow in Sarnia. Ethane is the most appropriate buffer agent for preventing contamination of such shipments. To that extent the Board accepts as a principle that some volume of ethane for this purpose should be included in the threshold volume.

As a final but very important principle in recommending a threshold volume, the Board proposes that the threshold volume be established and administered as a volume of ethane available at the inlet to the straddle system. By recognizing the threshold volume in terms of inlet rather than output volumes, the introduction of straddle plant efficiency improvements is not jeopardized nor are poor efficiencies perpetuated.

As well, the Board believes that an inlet threshold volume will result in a simpler system to administer if reinjection from field plants becomes necessary. Also, a threshold volume appropriately based on the inlet to the straddle plants provides an assurance to the Project that enhancement in ethane recovery made at the straddle plants to produce additional ethane would not simply facilitate additional upstreaming. Indeed, such an approach could form the basis for the Project to ensure a portion of the feedstock requirements for a third ethylene plant by upgrading the recovery efficiencies at the straddle plants.

In administering a threshold volume based on the inlet to the straddle plants, it may be necessary to make adjustments with time, if additional upstreaming occurs and lowers the ethane content of the gas streams feeding the straddle plants so substantially that the recovery capability of the plants is appreciably reduced.

In summary, the Board believes the principles used in determining the threshold volumes should be as follows:

- inclusion of existing ethylene plants,
- exclusion of planned ethylene plants,
- exclusion of the marketing component,
- inclusion of an ethylene-buffering volume, and
- defining of the threshold volume at the inlet to the straddle plants.

7.2.2 Actual Threshold Volume

With respect to the actual threshold volume, the Board believes it would be reasonable to provide for the currently-approved capacity of AGE C's two ethylene plants, AGE I and AGE II, plus a judgement portion of the

capacity increment which would result from debottlenecking the plants. The approved capacity of these two plants is $13.2 \times 10^3 \text{ m}^3/\text{d}$ ($83.3 \times 10^3 \text{ bbl/d}$) of pure ethane. On the basis of evidence presented at the inquiry the Board believes the volume protected for should be $14.2 \times 10^3 \text{ m}^3/\text{d}$ ($89.3 \times 10^3 \text{ bbl/d}$).

A buffering requirement of $500 \text{ m}^3/\text{d}$ ($3 \times 10^3 \text{ bbl/d}$) should also be included in the threshold. This is the estimated minimum needed for that purpose. The resulting total threshold output volume would thus be $14.7 \times 10^3 \text{ m}^3/\text{d}$ ($92.3 \times 10^3 \text{ bbl/d}$).

To convert this volume to a threshold volume at the straddle plant inlets, the Board deducted the contribution of Project field plants of about $950 \text{ m}^3/\text{d}$ ($6 \times 10^3 \text{ bbl/d}$) and divided the remainder by a capacity-weighted straddle system average ethane recovery efficiency of about 0.7, reflecting an average recovery factor of 70 per cent. This gives an inlet threshold volume of approximately $19.6 \times 10^3 \text{ m}^3/\text{d}$ ($123 \times 10^3 \text{ bbl/d}$) of pure ethane which the Board recommends for use in implementing the Government's policy.

The $950 \text{ m}^3/\text{d}$ ($6 \times 10^3 \text{ bbl/d}$) is the average ethane production over the past 4 years for the Waterton and Jumping Pound field plants which provide ethane to the Project. A review of relevant information suggests to the Board that these plants will be capable of delivering at least equivalent volumes for several years into the future. If production at these plants does decline below recent levels, the Board does not believe it would be appropriate to require other field plants to make up the underage as part of the threshold. It was therefore considered reasonable to subtract the $950 \text{ m}^3/\text{d}$ from the required volumes before calculating the threshold volumes necessary in the inlets to the Project straddle plants.

The Board recognizes that a substantial reduction in the ethane content of gas feeding the straddle plants, particularly if coupled with a sizeable increase in gas flow rates, could result in a situation where the inlet volume of ethane could exceed $19.6 \times 10^3 \text{ m}^3/\text{d}$ ($123 \times 10^3 \text{ bbl/d}$), but the straddle plants as they now exist would not be capable of an average 70 per cent recovery. The evidence at the inquiry respecting this matter was not conclusive but the Board believes the ethane content could change significantly before this situation would prevail. Nevertheless, the system recommended for adoption should allow for an adjustment to the threshold volume if at some future date the Project can satisfy the Board that the average ethane content of the gas feeding the straddle plants has been reduced, by further upstreaming, so substantially that an adjustment is warranted.

7.2.3 Duration of Policy

The Board believes that it would be unreasonable and unnecessary in terms of meeting the intent of the policy to implement a threshold volume for an indefinite time period as suggested by many Project participants. It questions, however, whether the 5 years suggested by the gas producers would be a lengthy enough period.

The Board considers that a reasonable approach would be to match the term of the threshold volume with the terms of the industrial development permits for the two ethylene plants. These were each for 20 years. Although not the full lives of the plants, a 20-year term would mean each plant had an assured feedstock supply for a period which would typically be well beyond that planned for a payout of investment.

Such an approach would mean that the above threshold figure of $19.6 \times 10^3 \text{ m}^3/\text{d}$ ($123 \times 10^3 \text{ bbl/d}$) would be effective through the end of 1998 to coincide with the permit term for AGE I, after which it would decrease to $10.0 \times 10^3 \text{ m}^3/\text{d}$ ($63 \times 10^3 \text{ bbl/d}$) through the end of 2004. Commencing at 2005, the threshold volume would be nil.

It should be noted that the Board recommends the exclusion of the $500 \text{ m}^3/\text{d}$ ($3 \times 10^3 \text{ bbl/d}$) buffering requirement after the permit term for the first ethylene plant has run out, the end of 1998. This is because the Board views the movement of ethylene out of the province as generally associated with the first ethylene plant rather than the second.

8 THE DETERMINATION OF THE PROCEDURES FOR REQUIRING AND THE MECHANISM FOR ENSURING REINJECTION OR SUPPLY OF ETHANE TO THE STRADDLE PLANT SYSTEM

8.1 Views of the Participants

8.1.1 Petrochemical Project

AGEC's position was that to ensure the supply of sufficient ethane to the straddle plant system, ethane should be reinjected by new field plants. The priority of obligation to restore the threshold volume, as recommended by AGECE, should be based on the "last built-first to reinject" principle. While SPO concurred with AGECE, ANG suggested that in case of shortfalls, new field plants should supply ethane to satisfy the threshold volume on a prorated basis reflecting field plant ethane volumes.

While other participants in the Project did not express any strong position on the priority of royalty ethane over producers' ethane for reinjection, AGECE submitted that royalty ethane from new plants should be taken before the producers' share from these plants.

Most participants in the Project indicated that the ethane required to maintain the threshold output volume could be reinjected or by-passed at field plants or could be supplied as volumes of ethane in kind directly to the Project. SPO noted that supply in kind by field plants would affect the straddle plant system cost structure unless the volume supplied is "deemed" to have been produced at the straddle plants. This would maintain the appropriate share of operating costs allocated to ethane production. AGECE concurred with the deeming proposal of SPO for volumes supplied in kind.

Both AGECE and SPO contended that the price of reinjected ethane or other liquids should be at the shrinkage cost (ie. the loss of Btu value in the gas sales market by removal of the heating value of the ethane). If the ethane is provided in kind, they said it should be priced at the shrinkage cost plus incremental cost of extraction at the straddle system. Other liquids (ie. propane and butanes) would be priced at their commodity value where supplied in kind.

AGECE recommended that legislative changes be put in place so that the Board could administer the maintenance of the threshold level. The Board would forecast ethane availability at the straddle system annually to assess the likelihood of having to order reinjection. The average annual threshold level would be converted to monthly entitlements based on the expected seasonal variation in gas throughputs. The Board would then monitor daily data to determine if reinjection were necessary. It would order reinjection of ethane by those ethane producers subject to the policy when there was a shortfall in the available ethane at the straddle system.

SPO and CEMJV concurred with the AGECE recommendations. EDI, on the other hand, suggested that after the policy is implemented through legislation, the Board should establish a joint task force to work out the details of the reinjection mechanics. ANG suggested that the Board direct a body or agency to administer the maintenance of the threshold level. It noted that NOVA or AEGS might be involved in monitoring threshold volumes through existing operational control systems.

8.1.2 Gas Producers

In order to restore a deficient threshold volume, EOG and IPAC agreed that the Project should first attempt to obtain the needed ethane volumes on the open market. If this were unsuccessful, then the Crown's royalty ethane from existing and new field plants should be either taken in kind or reinjected at the field plant gate for subsequent recovery at the straddle plants. Chevron and Shell, both EOG members, altered the order slightly and suggested that any deficit remaining after first using royalty ethane should be contracted for on the open market or alternatively, in Shell's opinion, prorated among all producers at each producer's contract price. Shell also emphasized that this should only occur after ethane exports from Alberta had been curtailed, straddle plants were not reinjecting or rejecting ethane¹, ethane storage facilities were being effectively utilized, and any physical constraints in the ethane gathering system had been removed.

Amoco regarded the priority of obligation for restoring the threshold volume slightly differently because of its position that existing field ethane extraction facilities should be grandfathered from the policy. In its view Crown royalty ethane and non-royalty production from new plants, respectively, should be used before Crown royalty volumes from existing field plants.

There was general agreement among the producers on the following points:

- The choice of whether to reinject ethane or supply ethane in kind should rest with the producer.
- The price to be paid for any ethane required to make up deficit threshold volumes must be based on its fair market value taking into account alternative uses and producers' contract prices.
- Advance notice for delivering deficient volumes was necessary. EOG and Norcen preferred a 90-day notice while Amoco said 60 days was sufficient.

1 Rejecting ethane means deliberately not extracting as much of the available ethane as possible.

- The threshold volume should be administered on an annual basis.

Both EOG and Chevron detailed specific procedures for administering the threshold volume. In EOG's recommendations, AGECE would submit ethane supply and threshold volume information for the previous year's actual system performance, an estimate for the current year's system performance, and a forecast for the forthcoming year utilizing only Alberta gas flows. This submission would be open to public scrutiny and any complaint would initiate a hearing. The regulatory authority would rule on the matter and release a report detailing the current and forecast years' ethane supply and threshold volumes.

Only deficient volumes identified for the forecast year would be supplied. If no shortfall were forecast and then one occurred, the petrochemical industry would be required to obtain such deficiencies on normal commercial terms. In the event of a forecast deficiency and the necessity for supplying field royalty ethane to the petrochemical industry, the regulatory authority would first request field producers to offer ethane for sale at freely negotiated prices. If the offered volumes were insufficient to meet the shortfall, then producers would be required to deliver their prorata share of royalty ethane to satisfy the remaining deficiency. Additional volumes needed could be supplied from producer-owned ethane and credited against royalty obligations for other gas components. If still further volumes were required, then the price of this supply should be determined by taking into account the owner's contract and alternative uses to determine fair market value.

Chevron's procedures would apply only if the volume of royalty ethane available were insufficient to make up threshold volume shortfalls. The Project would provide a forecast of ethane supply to the Board prior to 1 October of each year for the subsequent year. Once the Board was satisfied the threshold volume could not be maintained and the Project had proved that shortfalls could not be met through system operation or efficiency improvements, it would convene a hearing.

Field operators would have the option of mutually deciding the best way to make up the shortfall. If they were unable to reach a consensus by 1 December, then the Board would devise a suitable method for transferring ethane at fair market value. Each owner would have the choice of reinjecting or supplying ethane in kind.

By 1 February following the forecast year, the Project would furnish the Board with a comparison of the actual ethane supply to the previous supply forecast including any volumes transferred from field plants because of the policy. If the actual supply exceeded the forecast supply, then any field-supplied ethane would have to be returned to the owners either in kind or at fair market value or carried forward to make up a potential shortfall in the current year. If the actual supply were less than forecast, then a reverse procedure would be followed.

8.2 Findings and Recommendations of the Board

In the Board's view, the procedure that will be set up to require the reinjection of field plant ethane to maintain the threshold supply to the Project is a critical part of the Government's policy. Indeed, as this part of the policy and its implementation will affect the day-to-day operation of private sector industrial facilities, the perception of the extent of the Government's involvement and of the fairness of the procedures put in place could have broad effects on decisions for future investment in Alberta by all industries.

In deciding on a procedure to recommend to the Government regarding the reinjection or supply of field plant ethane to maintain the threshold volume, the Board first addresses a number of underlying principles which it believes should form the basis of the procedures. It then sets out the recommended procedures.

8.2.1 Principles

The first, and in the Board's view the most important principle to be considered, is the manner in which a price is established for ethane that is required to maintain the threshold volume. The Board notes the reference in the Government's policy statement that the price to be paid for reinjected or supplied ethane would be "...the incremental cost of ethane extraction at the straddle plants". Having the benefit of evidence presented at the inquiry, the Board is very concerned about this aspect of the policy. Although it has focused its attention on the implementation of the policy as stated, it believes the Government should consider a possible alternative for pricing the ethane required to maintain the threshold volume.

In the Board's view, to set rules that require a seller to participate in a sale in which he has no input with respect to price would be perceived by essentially all parties to be fundamentally unfair. Additionally, the Board notes that a stated objective of the policy is to allow a "functioning market" for ethane in the province. The Board believes that the pricing arrangement proposed in the policy could be a deterrent to achieving a functioning market over the long term. Also, requiring the sale of ethane at any preset price would be contrary to the efforts being made, and considerable accomplishments already achieved, toward a deregulated oil and gas industry.

While it seems clear that the Government has intervened in the dispute over ethane extraction at the prompting of both the petrochemical and gas-producing industries, the Board believes that implementing the policy in a way that minimizes Government intervention should be an objective. While it appears that the policy is necessary at the present time to resolve the current impasse, and to provide some assurance to the Project

respecting availability of feedstock supply, the Board believes that the pricing arrangements proposed may be a case of unnecessary, or at least undesirable, regulation taking the place of commercial arrangements.

Therefore, as a principle that would alter the policy as announced, the Board recommends that the price to be paid for ethane that is required to be provided to the Project to maintain the threshold volume should be negotiated between buyer and seller, whether the seller is the Government and the ethane being transferred is Crown royalty ethane, or the seller is a field plant owner and the ethane is working-interest ethane.

The Board is cognizant that situations might arise in which the Project is unable to successfully negotiate price with sellers for the full volume necessary to make up a threshold volume deficit. Therefore, as a backup to the proposed negotiated price, the Board recommends that changes to the relevant legislation be made that would allow a fair price in the Alberta public interest to be set by a neutral third party. This party could be an appointed body such as the Public Utilities Board or the ERCB, or the price could be set through arbitration. (In the remainder of this report the reference will be to a neutral third party.) To ensure that the price would be in the overall public interest, which includes the interests of both the Alberta petrochemical and gas-producing industries, the Government may also want to give direction as to those factors which should be considered in setting a price.

The volume and source of the ethane to be transferred at the price set by the neutral third party would be determined by the ERCB as described in the procedures outlined later in this section.

The second principle relates to the question of which owners of ethane should be obligated by the policy to make ethane available to the Project to maintain the threshold level. As described in Section 6.2, the Board believes it would be in the public interest that only field plants built since the announcement of the Government's policy should be subject to the requirement to reinject ethane to maintain a threshold volume. All ethane production from field plants approved and constructed or under construction prior to the policy, subject to certain conditions described in Section 6.2 regarding expansions or processing of new gas, should be exempt from any reinjection requirement. This would include the Crown royalty volumes of ethane from such plants, although the Board understands that the Crown is entitled to take its royalty in kind whenever it desires, and dispose of it as it sees fit.

Another question relates to the priority use of the royalty versus the working-interest share of ethane produced at an affected field plant. The Board recommends that the first ethane that should be made available to maintain a threshold is the Crown royalty share of production from new field plants. This is suggested because the commitment made to the

Project was by the Government and because support of the petrochemical industry would be in the overall public interest. The royalty volumes, which belong to the overall public, would thus be serving an important general public interest function. Where the amount of royalty ethane available exceeds the required reinjection rate, the Government would consult with affected plant operators and decide from which plants the royalty ethane would be supplied. Where the total royalty volume available from all affected plants is not sufficient to satisfy the required reinjection rate, the deficit would have to be made up from working-interest ethane from the affected plants.

It should be noted that the above discussion addresses sellers that are obligated by the policy to make ethane available to the Project. In the functioning market which the policy hopes to work toward, there would be no restrictions on which sellers could make ethane available to the Project. All sources of supply would compete for available markets.

As a final principle related to determining how much reinjection should be required, the Board believes the Project should generally carry the total risk for reductions in ethane available at the straddle plants caused by reduced gas flows or reduced natural ethane content in the gas but not related to upstreaming. In this context, the Board's reference to reduced gas flows is relative to conditions in 1987.

Although this is set out as a principle, the Board does not expect that it would come into play in determining actual reinjection rates as outlined in the following procedures. Over the long term, the Board expects that gas flows to the straddle plants will increase and result in substantially more ethane, in the absence of further upstreaming, being available at those plants than in 1987.

8.2.2 Procedures to Be Used

As stated in Section 7.2, the Board recommends that initially an annual average threshold inlet volume of $19.6 \times 10^3 \text{ m}^3/\text{d}$ (123 bbl/d) be available in gas streams flowing to the straddle plants, in addition to the volumes available to the Project from the Jumping Pound and Waterton field plants.

Based on gas production data collected by the Board, and information presented at the inquiry respecting the ethane content of gas streams flowing to the straddle plants, the Board estimates that about $24.3 \times 10^3 \text{ m}^3/\text{d}$ ($153 \times 10^3 \text{ bbl/d}$) of ethane were available at the inlets to the straddle plants in 1987. This suggests that with 1987 conditions of gas flow and ethane content, an average $4.8 \times 10^3 \text{ m}^3/\text{d}$ ($30 \times 10^3 \text{ bbl/d}$) of ethane upstreaming could take place before field reinjection or delivery in kind would be required. If gas flows and ethane availability at the

straddle plants occur generally as forecast, there will be considerable room for additional upstreaming to take place before an obligation would be placed on field plants to meet the threshold volume.

Having regard for the above numbers and the potential ethane production projected in Section 3, the Board concludes that it is unlikely procedures established to require reinjection to maintain the threshold volume will be needed in the immediate future. For this reason, the Board describes in this section only general procedures that it believes would be functional. Pending the Government's decision respecting the Board's recommendations, the Board believes that further consultation with industry would be beneficial in establishing the details of the procedure that would accommodate the interests of all parties to the extent possible.

In the procedure proposed by the Board, the first thing to be established for a future year is whether or not field plant ethane is expected to be needed to restore the threshold volume and, if so, how much. The Board proposes that each year it would prepare an annual forecast of ethane available to the straddle plants and of ethane production at new field plants with input from affected parties. If the expected average rate of ethane available at the straddle plants over the year is greater than the recommended threshold volume, then the Board would advise that no field plant ethane is expected to be needed to restore the threshold. However, if the annual forecast suggests a shortfall of ethane available at the straddle plants, again based on a comparison of the expected average production rate over the year with the threshold level, then some amount of reinjection would be required during the year.

To illustrate how this might be done, a situation could occur in some future year, where the ethane available in gas flowing to the straddle plants has declined to $17.5 \times 10^3 \text{ m}^3/\text{d}$ ($110 \times 10^3 \text{ bbl/d}$). Because this is less than the threshold of $19.6 \times 10^3 \text{ m}^3/\text{d}$ ($123 \times 10^3 \text{ bbl/d}$), it suggests that some reinjection is required.

If we assume that new field plants are recovering $8.0 \times 10^3 \text{ m}^3/\text{d}$ ($50 \times 10^3 \text{ bbl/d}$), the shortfall would be attributed to upstreaming. The Board would thus issue an initial information directive that $2.1 \times 10^3 \text{ m}^3/\text{d}$ ($13 \times 10^3 \text{ bbl/d}$) of pure ethane equivalent must be supplied to the Project on average throughout the next year. It would also indicate the average royalty volumes expected from new field plants during the year. If we assume these would total $1.6 \times 10^3 \text{ m}^3/\text{d}$ ($10 \times 10^3 \text{ bbl/d}$), the information directive would indicate that the remainder of the shortfall must be supplied by working interest owners, ie. $0.5 \times 10^3 \text{ m}^3/\text{d}$ ($3.1 \times 10^3 \text{ bbl/d}$). On the other hand, if royalty ethane amounted to $2.1 \times 10^3 \text{ m}^3/\text{d}$ ($13 \times 10^3 \text{ bbl/d}$) or greater, the directive would indicate that no working-interest ethane was expected to be needed.

This information directive would be issued at least 90 days before the calendar year in question. The Project and field producers, including the Crown, would then be given 60 days to negotiate arrangements. It is only if the Project came back to the Board, in the last 30 days before the subject year, and stated it could not obtain the needed volumes, that the Board would issue a threshold volume make up directive. This would direct that the needed volumes which were not obtained through negotiation be made available by the Crown and working interest owners, as appropriate.

With the above-described procedure, the Project would in some instances obtain the required ethane volumes through negotiation, and in other instances as a result of a specific direction from the Board. In either case, the Board expects that negotiations between the buyer and the seller or sellers would establish pricing arrangements for the ethane. Other matters that would be subject to negotiation would include the price of other NGL, if necessary; whether the ethane is to be reinjected into residue gas at the field plant or supplied in kind, and if so at what location; periods of reinjection or delivery suitable to both the buyer and the seller; and the rates at which the ethane would be reinjected or otherwise made available.

Through this negotiation approach, and if the Government accepts the Board recommendation regarding price, the Board is hopeful that all or almost all of the ethane required to maintain the threshold volume could be acquired contractually. In the Board's view, this would be the most desirable way to accommodate the interests of buyer and seller.

As indicated previously, in situations where the Project is unable to secure the total amount of ethane needed to maintain the threshold, even after all royalty ethane from affected field plants is used, the Board would decide the reinjection rates needed at such plants.

To establish the reinjection rates needed, the Board proposes that it would simply divide the outstanding, uncontracted requirement by 365 days and set a fixed average daily rate for the year. Owners of affected field plants would first have the opportunity to decide among themselves which plants would supply the ethane so that disruption to their own markets would be minimized. Failing agreement among the field plant owners, the Board would prorate the reinjection requirement among the affected field plants based on each plant's net-of-royalty share of total upstream production.

In order to make adjustments to the ethane directed to be supplied to the Project, the Board believes that it would be reasonable to allow for a quarterly review of the ordered reinjection rate at the request of either the field plant owners or the Project. The Board would be prepared to adjust the reinjection requirement up or down if it were satisfied that a

discrepancy exists between the forecast ethane available and the actual ethane available. In making the adjustment it would carry forward any under- or over-reinjection that resulted from the inaccuracy of the forecast, and any under-reinjection that occurred because a plant operator did not reinject in accordance with the Board's direction. In addition, the adjustment would reflect the principle that delivery or reinjection of ethane would not be required to the extent that the Project is by-passing ethane around the straddle plant system and not recovering it.

Where arrangements for make-up of threshold volumes could not be negotiated and Board involvement is necessitated, some of the additional guidelines the Board would use are as follows:

- The choice of whether to reinject or deliver ethane in kind would rest with the operator of the field plant.
- Where ethane is delivered in kind, the volume would be adjusted downward to match that which would have been actually recovered at the straddle plant which processes the gas at its then-existing recovery efficiency.
- Where ethane is delivered in kind, the location for delivery must be at a suitable point on the Project's ethane gathering and storage system.
- There would be no requirement to provide propane or heavier hydrocarbons to the Project.
- Reinjection would be required daily at the average rate required for the year.
- The Project would be responsible for any shortfalls in threshold volume which occur because of reduced gas flows relative to 1987.

Where arrangements cannot be made regarding the price for ethane, as indicated earlier, the Board recommends the price be set by a neutral third party. The price set would be that judged to be fair and in the overall public interest. The Government may wish, in amending the legislation, to provide terms of reference for the setting of the price. Some of the matters this Board believes might be considered would include

- an attempt to balance the interests of the buyer and seller,
- the available markets for ethane,
- the value of ethane as a commodity,

- the heating value of ethane as part of the gas stream,
- the cost of extracting the ethane at the field plant and the incremental cost that would have been incurred had it been extracted at the straddle plant, and
- the cost of reinjection of the ethane back into the gas stream or delivering it in kind to an acceptable delivery point.

The Board has stated its opinion in several past decisions that it believed the resolution to the ethane extraction dispute that would best serve Alberta's public interest should be achieved through negotiation between field plant proponents and the Project. The Board continues to believe this to be the case and also that the proposed system, with the emphasis on negotiation between the buyer and seller, would provide the best way to implement the Government policy.

**9 PROCEDURES THAT SHOULD BE USED FOR THE EXPEDIENT
REGULATORY PROCESSING OF APPLICATIONS FOR FIELD
ETHANE EXTRACTION FACILITIES**

9.1 Views of the Participants

9.1.1 Petrochemical Project

The Project participants all suggested that applications for new field ethane extraction facilities (or expansions of existing plants) should be granted if the Alberta public interest is satisfied. They indicated that if their recommended threshold volume and procedures for making up deficiencies are accepted, there is no need for lengthy hearings. However, they recommended that notice of all applications should be given such that adversely affected parties could have a chance to intervene if necessary.

The Project argued that if the threshold level is not satisfactory, the approval of upstreaming facilities would affect the cost structure of the ethane production at the straddle plants and it would have to oppose future applications.

ANG recommended that the Board scrutinize the applications utilizing existing procedures with primary issues to consider being the amount of incremental ethane recovered, economic benefit to Alberta, and avoiding duplication of facilities.

9.1.2 Gas Producers

EOG suggested that approvals of upstream ethane extraction facilities could be made more routine by dispensing with the public hearing process when there were no contentious issues relating to environmental, safety, or conservation aspects of the specific project. In its view, such applications should be considered by the Board in the same manner as any other gas processing application. To support its position it referenced the Administrative Procedures Act R.S.A. 1980 where, in its interpretation, section 6 does not make a public hearing mandatory and section 4(a) permits a regulatory authority to determine the evidence relevant to an application. Evidence pertaining to the impact of upstreaming on the Project would be irrelevant once the public interest was determined by the setting of a threshold volume.

Chevron, on the other hand, interpreted sections 3 through 7 of this Act as appearing to make it impossible for the Board to refuse to hold a hearing if an affected party insisted on one. In order to overcome this perceived problem and thus to expedite application processing procedures, Chevron viewed as necessary changes in legislation to effectively suspend a party's right to a hearing under the Administrative Procedures Act and the Energy Resources Conservation Act. In addition, Chevron suggested

that were the Board to treat ethane extraction applications as "technical applications" as intended in the Oil and Gas Conservation Act and Regulations, the problem of lengthy hearings would not arise and the approval process would be automatically accelerated. Chevron used the term "technical applications" to mean dealing only with the limited issues of location, conservation, and environmental matters as they pertain to a specific facility application and the issue of orderly, economic, and efficient development as it pertains to a specific geographic area.

IPAC stated that it was not suggesting anyone be denied the right to a hearing, but that the long, protracted, adversarial hearings of the past relating to ethane supply/demand requirements could be avoided by setting a reasonable threshold volume and thus limiting the main issues to capacity design and dedication of ethane.

Both Shell and Norcen reiterated that policy implementation should avoid the need for most hearings, especially long adversarial ones, and emphasized the desirability to consider ethane extraction facility applications on the same basis as other gas processing applications. Shell suggested that the Board should specifically use legislation or procedural direction to limit the scope of future applications once the policy is implemented. In particular such applications should not consider province-wide or export ethane supply/demand comparisons or straddle plant/field plant efficiency comparisons in future.

9.2 Findings and Recommendations of the Board

The Board notes that the policy statement anticipates implementation of the policy whereby field plants can proceed with ethane extraction subject only to

- more expeditious regulatory approval, and
- the condition that the field plants may be required to reinject or supply ethane to the straddle plant system.

This section deals only with more expeditious regulatory approvals.

Section 29 of the Energy Resources Conservation Act states that the Board, in deciding on an application, must provide an opportunity to be heard to any party which could be adversely affected by approval of the application. This clause of the Act does not identify nor restrict the type of adverse impacts that must be considered by the Board. In practice, an ethane-recovery processing scheme has been subject to the conservation and environment requirements specified in ERCB and Alberta Environment Acts and Regulations; and such a scheme has been subject to to the scrutiny and objection of any party which perceives it would be

adversely impacted. This practice has led to the protracted application-handling process of the past 7 or so years, and it is desirable that this process be made more straightforward and less onerous on all parties.

The Board believes that the intent of the policy is to enable the Board to handle applications for ethane extraction in much the same manner it handles all other schemes to process gas. That is, after the Board is satisfied that the conservation, social, and environment requirements of the scheme are met, the scheme is generally in the public interest; and given that any approval would be subject to the ethane policy, the Board would expeditiously issue its approval of the scheme. The Board is prepared to adopt such an approach. In doing so, however, it recognizes that after an approval is issued, a party believing it would be adversely affected by the scheme could then apply to the Board for a hearing under section 43 of the Energy Resources Conservation Act. The Board would have to hear the matter or specifically rule that, since the approval was in accord with the ethane policy, the party making the application would not be affected by the scheme. A similar position, although not specifically stated, would have been taken in the original issuance of the approval without notice or hearing.

If, in practice, it turns out that the "expeditious approval" approach is not working as intended, the Government may wish to consider changes to the relevant legislation.

10 THE EXISTING AND POTENTIAL EFFICIENCY OF ETHANE EXTRACTION AT THE STRADDLE PLANTS, THE INVESTMENT REQUIRED TO ENHANCE EXTRACTION, AND POTENTIAL LINKAGE WITH THE THRESHOLD VOLUME

10.1 Views of the Participants

10.1.1 Petrochemical Project

SPO suggested that the concentration of ethane remaining in the residue gas stream exiting the plant is a better measure of the plant efficiency than a ratio of the ethane recovered to that entering the plant. They indicated that since the residue gas from the straddle plants contains, on the average, 1 per cent ethane, their recovery efficiency is as high as field plants which typically leave a similar ethane content in their residue gas.

SPO also argued that the straddle plant system is the most efficient way to recover ethane since it extracts ethane from all gas streams leaving the province, including those which have lower ethane content. The field plants, on the other hand, are typically built only at locations where gas with high liquids content can be processed.

SPO submitted a report by Fluor¹ which identified specific measures that could further increase ethane recovery at their plants. The most viable options for improving the recovery efficiency were identified to be at the Petro-Canada Empress plant and the Dome Empress I and Dome Empress II plants. The technology proposed by Fluor for the three plants would be the addition of low-temperature absorption sections to treat the expander outlet vapour streams. Under questioning, it acknowledged that no plant yet exists with the proposed process configuration that operates at the relatively lean ethane inlet concentrations that are experienced at the Empress plants.

SPO explained that for the Petro-Canada plant, an incremental ethane recovery of $1.41 \times 10^3 \text{ m}^3/\text{d}$ ($8.89 \times 10^3 \text{ bbl/d}$) could be achieved for an incremental capital investment estimated at \$44.8 million. For Dome Empress I, an incremental ethane recovery of $1.79 \times 10^3 \text{ m}^3/\text{d}$ ($11.28 \times 10^3 \text{ bbl/d}$) could be achieved for a capital investment estimated at \$37.8 million. For Dome Empress II, an incremental ethane recovery of $925 \text{ m}^3/\text{d}$ ($5.83 \times 10^3 \text{ bbl/d}$) could be achieved for a capital investment estimated at \$14.3 million. SPO estimated the cost of service of the additional ethane at 11.57 to 31.26 \$/m³ (exclusive of shrinkage cost).

1 Study Report - Ethane Recovery Improvement Options - Empress Straddle Plants. Fluor Canada Ltd., November 1987 (Exhibit 7Z).

SPO said that the ethane content of residue gas from the above plants would be reduced by almost one-half of the existing level if the modifications were put in place. For the Petro-Canada plant, the ethane content of its residue gas would decrease from the current 1.4 mole per cent to 0.7 mole per cent, for the Dome Empress I plant it would decline to 0.9 mole per cent from 2 mole per cent, and for the Dome Empress II plant, the corresponding figures would be a reduction to 0.7 mole per cent from the current level of 1.2 mole per cent.

SPO argued that the threshold output volume level should be increased to recognize improvements of the recovery efficiency made at the straddle plants. ANG indicated that its straddle plant at Cochrane, which receives an ethane-rich stream, is operating at a very high efficiency level of 87 per cent. However, improvements could still be incorporated to increase the ethane recovery level to 94 per cent. This would result in an increased recovery of 590 m³/d (3.70 x 10³ bbl/d) with an investment estimated at \$3.6 million.

ANG also emphasized that modifications (expansion, debottlenecking, efficiency improvements) should be encouraged through upward threshold volume output adjustments.

Shell also reviewed the costs of increasing the ethane recovery efficiency at its Waterton and Jumping Pound plants and concluded that under perceived economic conditions it would not be viable to expand or modify these plants.

EDI did not make specific comments on improvement in the recovery efficiency of the straddle plants. It indicated that these modifications are economic decisions.

Both AGECE and CEMJV indicated that they concur with the evidence presented by SPO. AGECE emphasized that the threshold output volume should recognize any incremental ethane recovered through improvement of straddle plant efficiencies.

10.1.2 Gas Producers

EOG viewed the straddle plant system to be, for the most part, inefficient and obsolete pointing to the significantly higher ethane extraction efficiencies achieved by the newer field plants. It saw no usefulness to the inquiry in the Handwerk Study² submitted by SPO nor any relevance to Issue 5 of the policy statement respecting the economically

2 Effect of Ethane Upstreaming on Straddle Plant and Total Provincial Ethane Production, G. E. Handwerk (filed as part of Straddle Plant Owners Direct Evidence (Exhibit 7k)).

or technically achievable maximum ethane recovery. In its assessment of the inquiry evidence, EOG concluded that barrels of ethane not recovered in the field are not recovered at the straddle plants on anything near a one-for-one basis.

EOG testified that, in its opinion, the Fluor Study utilized inappropriate, outdated technology which overstated the costs. It believed it would be feasible using new technology to bring the ethane in the residue gas down to about the 0.6 per cent level at much lower unit costs. Hence, EOG saw significant scope for improving recovery efficiencies at the Empress plants and thereby expanding the ethane supply. It acknowledged, however, that it knew of no other system operating on a feed stream with as low ethane content as that at Empress.

IPAC pointed to the higher recoveries at the field plants. It also offered two potential efficiency definitions: one, the more common definition of per cent removed divided by per cent in the inlet stream, and the second, the percentage left in the residue gas. IPAC indicated that it preferred the second definition and that it believed technology was available to permit extraction efficiencies to less than 1 per cent in the residue stream.

With the exception of Shell and IPAC, there was agreement among producer interests that there should be no linkage between any increased efficiency and the threshold output volume. IPAC suggested adjusting the threshold volume by using an efficiency differential calculated on the basis of the difference in the per cent ethane left in the residual gas stream between older and newer plants times the net capacity threshold volume determined from AGE I and II design capacity requirements less exported ethylene/ethane. However, the threshold volume would never exceed the AGE I and II design capacity requirements. Shell favoured a lower threshold volume which would gradually phase out, thus encouraging increased recoveries at straddle plants and ultimately encouraging toll processing of producers' gas.

Chevron maintained that if implementation of the policy encouraged efficient ethane recovery, then there would always be a sufficient ethane supply; and steps to maintain a threshold output volume would never have to be put into effect.

IPAC and Shell noted that insufficient capacity in the western leg of the AEGS was already causing ethane to be rejected in plants connected to that leg. Increased capacity would have to be installed to allow increased ethane supplies to be available to the Project. On a similar note, EOG agreed that constraints in the Project's ethane gathering and storage system should be taken into account in determining the suitability of upstream injection to satisfy the threshold volume.

10.2 Findings and Recommendations of the Board

With respect to the straddle plant efficiency issues, the Board's primary objective in making its recommendations to the Government is that the policy be implemented in a way that does not inhibit or preclude future enhancement at the straddle plants that could further reduce the ethane content of the natural gas streams leaving the province. The Board believes such would be in the public interest so long as there are potential markets for the ethane that is recovered and its value is higher than its fuel value if left in the natural gas. In the Board's view, increased recovery of ethane in Alberta will be desirable for the foreseeable future.

The Board believes that its recommendation that the threshold volume be established as a volume available in the gas flowing into the straddle plants - a threshold inlet volume - accomplishes the above objective. By fixing the threshold as proposed, the Project is assured of a supply of ethane available to it which at the current straddle plant efficiencies is sufficient to meet the feedstock requirements of the two ethylene plants. The Board is also prepared to make adjustments to the threshold volume if new upstreaming lowers the ethane content such that the current efficiencies could not be achieved.

The Project can decide in the future whether or not to enhance the efficiency of the plants to recover more of the ethane available to it based on the usual commercial considerations, whether there is demand for the additional ethane that could be extracted, and whether its cost would be competitive with alternative supplies. Those investment decisions would not be at risk at least in terms of the threshold inlet volumes set by the ethane policy.

With respect to the potential ethane recovery efficiency that could be achieved at the straddle plants, the Board notes the evidence presented by SPO that suggested a number of process modifications that would reduce the ethane content of the residue gas streams from the current range of 1.0 to 1.5 per cent to a range of about 0.5 to 1.0 per cent. The evidence suggested that an additional amount of almost $4.8 \times 10^3 \text{ m}^3/\text{d}$ ($30 \times 10^3 \text{ bbl/d}$) of ethane could be extracted by the straddle plant system if the outlined efficiency enhancements were undertaken, although the amount of additional ethane could be less depending on the amount of further upstreaming that might occur. On the basis of the evidence submitted to the inquiry, the Board estimates that as much as two-thirds of the potential additional extraction or some $3.2 \times 10^3 \text{ m}^3/\text{d}$ ($20 \times 10^3 \text{ bbl/d}$) might be recoverable from the threshold inlet volume and therefore not affected by upstreaming. Such a volume could form part of the feedstock supply to a third ethylene plant.

The Board also expects that, under the proposed policy, the Project would actively negotiate with producers who may potentially upstream the straddle plants to avoid that prospect. The Board believes that under those conditions, significant additional volumes could continue to be dedicated to the Project.

11 ANY LEGISLATIVE CHANGES REQUIRED TO IMPLEMENT THE POLICY

11.1 Views of the Participants

11.1.1 Petrochemical Project

Project participants who commented on the necessary legislative changes recommended that changes be made to the Oil and Gas Conservation Act and Regulations to enable the Board to administer maintenance of the threshold volume level. Both AGECE and EDI made specific comments on the changes to the Oil and Gas Conservation Act and Regulations, in particular, section 26. AGECE also recommended that section 10 of the Oil and Gas Conservation Act be amended to add jurisdiction for the Board to make regulations

"(a.2) providing for the implementation, control and monitoring by the Board of any scheme which may have the effect of limiting the amount of gas products which may be extracted from gas, or which may necessitate the by-passing or reinjection of gas or gas products at gas processing facilities."

Its recommendation on section 26 (which requires Board approval of gas processing schemes) is to add the following:

"26.1 In approving any application under this subsection for the removal of any gas product or gas products from gas, the Board may make such approval conditional upon any terms and conditions that the Board may prescribe, including:

- (a) a limitation as to the amount of a gas product or gas products which may be extracted from the gas,
- (b) provisions for the by-pass or reinjection of gas, gas product or gas products as may be directed by the Board from time to time."

EDI recommended more detailed and extensive additions to section 26 which would give the Board specific authority to implement the ethane policy. These recommendations relate specifically to its suggestions of how the policy should be implemented.

11.1.2 Gas Producers

IPAC and Amoco made no comments respecting required legislative changes. There was general agreement among the others, however, that the Board does not currently have the authority to order reinjection or delivery of ethane to meet any threshold volume deficiencies. Hence, changes to the Energy Resources Conservation Act and the Oil and Gas Conservation Act would be necessary.

Chevron suggested that whatever the mechanism established, it should be quasi-judicial to ensure fairness to all affected producers. Both Shell and Norcen emphasized that any changes in legislation should not adversely affect ownership rights. Shell added that any legislated policy should rapidly devolve into a free-market-oriented approach. Norcen recommended that any changes should reflect concern for simplicity and efficiency of administration.

11.2 Findings and Recommendations of the Board

As noted in Section 9.2 of this report, implementation of the policy statement will result in two key changes for future field ethane extraction schemes. These changes would result in more expeditious regulatory approval and approval conditions that may require reinjection or supply of ethane to the straddle plant system.

It has been suggested by several of the inquiry participants that specific legislative provisions, some enabling and some restrictive in nature, will be necessary to accommodate the changes. The Board agrees that the changes which would flow from the Board's recommendations made earlier in this report will require a detailed review of, and possible revisions to, the applicable acts and regulations. The Board's views regarding expeditious processing of ethane applications are set out in Section 9.2 of this report. The following are its views respecting the inclusion of conditions in approvals which would require the reinjection or supply of ethane to the Project.

If the Board's recommendations for implementation of the ethane policy are adopted, approvals of new field plants whose residue gas is subsequently reprocessed by the straddle plant system would be subject to two ethane-related conditions.

The first condition would state that the scheme is subject to a call for ethane which may be made if the Board determines the threshold volume must be maintained by field plant ethane. The condition would state that the Crown ethane would first be subject to reinjection or supply to the Project, but that some or all of the working interest ethane may also be called for.

The second condition would state that the price for the ethane to be reinjected or otherwise supplied would be the subject of negotiation between the Project and, as applicable, the Crown and the field plant owners subject to the condition. The condition would state that failing agreement on the ethane price, the price would be set by a neutral third party operating under predetermined terms of reference. The latter would ensure that the price set would be that judged to be fair and in the overall public interest.

The Board believes that it may have the authority under the general powers provision, section 15 of the Energy Resources Conservation Act, to condition processing scheme approvals in the manner described above. However, to avoid potential problems it recommends that the Oil and Gas Conservation Act be amended to give it the specific power to so condition approvals.

Depending on the particular selection of the neutral third party, a further change to legislation would be required to give the party jurisdiction to set prices and also to spell out the matters to be considered in establishing prices.

The potential case of gas produced outside of Alberta but moved into Alberta for processing was raised at the inquiry. The Board believes that Alberta would have only limited jurisdiction over this gas, and recommends that it not be subject to the ethane policy. To try to make such gas subject to the policy could result in its being processed outside Alberta which could be contrary to the province's interest.

In its preliminary review of the necessary legislative changes, the Board has considered in a general manner whether the required legislative provisions would raise serious questions in such areas as free trade, deregulation, and the Constitution. The Government may wish to review these matters in greater detail.

12 ANY OTHER RELEVANT MATTERS

There was much discussion at the inquiry of a number of other ethane-related matters. These included views of various parties respecting matters such as proprietary rights of producers, Canada/U.S. trade, the importance of EOR, a free market versus a regulated market, and current cost-of-service contracts. The Board had appropriate regard for all of these matters in shaping its recommendations to the Government. It does not believe that there are any other matters which require specific comments.

13 SUMMARY OF RECOMMENDATIONS

The Board recommends to the Government that it implement the ethane policy in accordance with the following set of recommendations.

Facilities that should be part of policy

1. The threshold volume should make provision only for ethane to supply petrochemical plants which were approved and operating or under construction at the time of announcement of the policy.
2. Field plants extracting ethane which were approved and operating or under construction at the time the policy was announced should not be subject to the condition to supply ethane to support the threshold volume. If such plants undergo major expansion or if significant new reserves are connected to them, the expansion or new reserves should be made subject to such a condition.
3. New field plants extracting ethane should be subject to the condition to supply ethane to support the threshold volume except where they are not delivering lean residue gas to a stream which is subsequently processed by a straddle plant. For plants not delivering lean residue gas to the straddle plants, exemption from the policy condition would continue as long as they operate in that mode.

The setting of the threshold volume

4. The approximate debottlenecked capacity of the existing ethylene plants AGE I and II, $14.2 \times 10^3 \text{ m}^3/\text{d}$ ($89.3 \times 10^3 \text{ bbl/d}$) of pure ethane¹, should be provided for as part of the threshold volume. Planned expansions to existing ethylene facilities and new facilities such as AGE III should not be, because the necessary investments have not as yet been made.
5. The ethane marketing component of the Project should not be included in the threshold volume other than a minimum volume of $500 \text{ m}^3/\text{d}$ ($3 \times 10^3 \text{ bbl/d}$) of pure ethane for use as a buffer to move ethylene batches through the Cochin Pipeline.
6. The threshold volume should be expressed on the basis of ethane at the inlet of the straddle plants, ie. threshold inlet volume. Such a system would be administratively less complex than threshold output volume and would encourage investments in upgrading of the straddle plants.

1 Specification ethane is approximately 94 per cent ethane and therefore volumes expressed as specification ethane are some 6 per cent larger than those expressed as pure ethane.

7. The capacity of the existing ethylene plants and the required buffer volume, when adjusted for straddle plant extraction efficiencies, results in a threshold inlet volume at the Project straddle plants of $19.6 \times 10^3 \text{ m}^3/\text{d}$ ($123 \times 10^3 \text{ bbl/d}$) of pure ethane. This, in addition to the some $950 \text{ m}^3/\text{d}$ ($6 \times 10^3 \text{ bbl/d}$) which is committed to the Project from field plants at Waterton and Jumping Pound, would provide the ethane necessary for feedstock for the two debottlenecked ethylene plants as well as for buffering ethylene batches in the Cochin Pipeline.
8. The protection for the two ethylene plants should be for the terms of their respective industrial development permits. Each of these was initially for 20 years. This would mean the full threshold inlet volume of $19.6 \times 10^3 \text{ m}^3/\text{d}$ ($123 \times 10^3 \text{ bbl/d}$) would be provided until the end of 1998. The protection for AGE I and the buffer would then expire, leaving a threshold inlet volume of $10 \times 10^3 \text{ m}^3/\text{d}$ ($63 \times 10^3 \text{ bbl/d}$) through to the end of the year 2004. Protection under the policy would be discontinued at that time.

Procedures for supplying ethane to the straddle plant system

9. The Government should reconsider the position put forward in the policy statement that the price to be paid for reinjected or supplied ethane would be the incremental cost of extracting the ethane at the straddle plants. As an alternative that would be more in the public interest, the price to be paid for such ethane should be negotiated between buyer and seller. The relevant legislation should be changed to assure that a fair price be set by a neutral third party in those situations where a price could not be negotiated.
10. For those plants which must provide ethane to the Project to maintain the threshold inlet volume, all of the Crown royalty ethane should be so provided before any freehold royalty ethane or working-interest ethane is subject to the requirement. Royalty ethane from those plants not subject to the requirement to supply the Project should not be affected by the policy. This would not preclude the Crown taking such royalty ethane in kind and providing it to the Project if it so desired.
11. The requirement to provide ethane to the Project should be based on an annual forecast made by the Board at least 90 days prior to the year in question. The forecast should recognize input from affected parties. The Board should advise as to whether it is expected that ethane would be needed to maintain the threshold inlet volume for the coming year and, if so, the quantities. Sixty days would then be provided for the Project, the producers, and the Crown to negotiate sales of the needed make-up volumes.

12. Provision of ethane to the Project would be ordered by the Board only if negotiations for make-up volumes failed. The directed supply would be on an average-day basis for the full year and would be subject to adjustment on a quarterly basis if necessary to reconcile differences between actual and forecast ethane availability.
13. Where provision of ethane to the Project is directed by the Board, it would be done in accordance with a set of guidelines which would be established by the Board and made known to all parties.
14. Affected field plants would be required to provide ethane to the Project to the extent that the shortfall in ethane resulted from upstreaming as opposed to reductions in gas flow at straddle plants.

Procedures to be used for expedient processing of applications

15. The Board would approve, without hearing or notice, any ethane extraction application if it were satisfied that conservation, social, and environment requirements were met, and if the scheme were in the public interest; and any approval would be in accordance with the ethane policy.

Extraction efficiencies at straddle plants

16. Expression of the threshold volume as an inlet to the straddle plants, as set out in item 6, would encourage the upgrading of recovery efficiencies at the straddle plants.

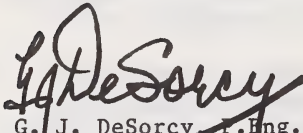
Necessary legislative changes

17. The relevant legislation should be changed to ensure that the Board has jurisdiction to condition processing scheme approvals to require that ethane be made available to maintain the threshold inlet volume, and that the price of such ethane be subject to negotiation, or failing agreement, be set by a neutral third party.
18. The relevant legislation will require amendment to establish the jurisdiction and terms of reference for an appropriate neutral third party to set prices for ethane supplied to the Project where a negotiated price could not be achieved.


19. Gas produced outside of Alberta, but processed within the province, should not be subject to the ethane policy.

DATED at Calgary, Alberta, on 11 April 1988.

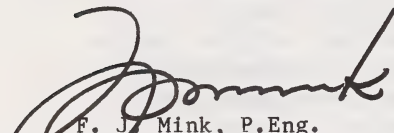
ENERGY RESOURCES CONSERVATION BOARD



G. J. DeSorcy, P.Eng.
Chairman



N. A. Strom, P.Eng.
Vice Chairman



F. J. Mink, P.Eng.
Board Member

APPENDIX 1A GOVERNMENT OF ALBERTA POLICY STATEMENT ON ETHANE

- Letter dated 21 August 1987 from The Honourable Dr. N. Webber, Minister of Energy.
- Policy Statement on Ethane.

RECEIVED AUG 21 1987

ENERGY

Office of the Minister

228 Legislature Building, Edmonton, Alberta, Canada T5K 2B6 403/427-3740

August 21, 1987

Mr. G.J. DeSorcy
Chairman
Energy Resources Conservation Board
640 - 5 Avenue S.W.
Calgary, Alberta
T2P 3G4

Dear Mr. DeSorcy:

The Government of Alberta has recently announced a policy with respect to ethane. A copy of the policy statement is attached.

The policy statement indicates that the Government intends to amend the legislation to require that approvals of upstream ethane plants be made subject to the condition that if ethane volumes at the straddle plants fall below certain 'threshold volumes', the upstream plants will be obliged to reinject ethane to the straddle plant system to maintain threshold volumes or to supply ethane at the incremental cost of extraction of the straddle plant system.

The Government requests that the Energy Resources Conservation Board include such conditions in all approvals of upstream ethane extraction facilities, but otherwise ensure expeditious processing of applications.

The statement indicates the need for further consultation with the industry and consideration of the policy, its implementation, and any amendments to the legislation required to implement the policy.

I am hereby requesting that the ERCB consider and report on the ethane policy, with particular reference to the following specific matters:

1. The determination of the ethane facilities which should be affected by or be part of this policy.
2. The principles that should be used in determining the threshold volumes and the actual volumes thereby determined.

. . . / 2

- 2 -

3. The determination of the procedures for requiring and the mechanism for ensuring re-injection or supply of ethane to the straddle plant system.
4. Procedures that should be used for the expedient regulatory processing of applications for field ethane extraction facilities.
5. The existing and potential efficiency of ethane extraction at the straddle plants, the investment required to enhance extraction and potential linkages with threshold volumes.
6. Any legislative changes required to implement the policy.
7. Any other relevant matters.

I look forward to a timely report on this matter because, as you are aware, there are currently a number of active applications to recover ethane at field plants. If possible, the report should be available by November 15, 1987. If this is not feasible, I would appreciate being kept informed as to when I may expect your report.

Sincerely,

Neil Webber

Neil Webber
Minister

Attachment

POLICY STATEMENT ON
ETHANE

Over the last ten years a world-scale ethane based petrochemical industry has located and expanded in Alberta. Development of the industry represents a major success in terms of the Government's objectives of economic diversification and maximum upgrading of Alberta's resources within the Province. This development reflects the industry's recognition of the stable and supportive business environment in Alberta and the long-term, secure, market-priced supply of the essential petrochemical feedstocks.

The Alberta Government also recognizes the important economic contribution of the oil and gas industry to Alberta and the investments it has made in support of a major objective of the Alberta Government, the encouragement of optimal resource development. As part of this objective, Enhanced Oil Recovery (EOR) by hydrocarbon miscible floods has been specifically encouraged by incentives under section 4.2 of the Petroleum Royalty Regulation.

The feedstock of the existing ethylene-based petrochemical industry is ethane, principally extracted at "straddle plant" facilities located at Empress and Cochrane, Alberta. During the last decade, there has been increasing demand for field extraction of ethane to provide solvent for enhanced oil recovery and, potentially, to provide feedstock for petrochemical facilities. It has been stated that the construction of ethane extraction capacity upstream of the straddle plants, which removes ethane which would otherwise be available at the straddle plants, could affect the availability of adequate supplies of ethane at the straddle plants to meet current petrochemical obligations.

Applications to the Energy Resources Conservation Board (ERCB) to recover ethane at field plants upstream of the straddle plant system have resulted in numerous lengthy public hearings. As a result, the Government has received numerous representations from the petrochemical, gas-producing, straddle-plant and enhanced oil recovery industries to take some action to improve the situation.

The Alberta Government believes that sufficient ethane is and will be available in the province to meet foreseeable demand for ethane for both petrochemical feedstock and EOR solvent. However, continued upstreaming has the potential to jeopardize straddle plant ethane supply, especially during periods of low natural gas flows through the straddle plants.

Therefore, the Alberta Government is announcing measures to maintain a functioning market in ethane wherein both the petroleum and petrochemical industries will have access to adequate and competitive sources of ethane supply and the incentive for further development of ethane-related activity in the province.

The Alberta Government re-affirms its policy to ensure that ethane will be available for petrochemical use in Alberta. More specifically, the Government will take action to require the Energy Resources Conservation Board to include in further approvals of upstream ethane extraction facilities a condition that the upstream plants will be required to reinject or supply to the petrochemical industry, which depends on straddle plant ethane, sufficient ethane to maintain the "threshold volumes" required by the petrochemical industry.

If ethane availability at the straddle plants drops below the "threshold volumes", then the ERCB will direct upstream plants subject to the condition to reinject or supply (at the incremental cost of ethane extraction at the straddle plants) ethane to restore the threshold level.

In this manner, the petrochemical industry is assured that its straddle plant supply cannot fall below "threshold volumes". With this security of supply the petrochemical industry can proceed with investment in additional ethylene capacity and in enhancing ethane extraction efficiency at the straddle plants.

The policy also means that the petroleum industry can proceed with upstream ethane extraction, in addition to other non-upstreaming facilities, subject only to more expeditious regulatory approval by the ERCB and the condition that they may be required to reinject or provide ethane to the straddle plants. As a result of this policy such approvals

should become routine and not be subject to the major upstreaming hearings experienced between 1981 and 1986.

In order to address the administrative issue of levying royalty on ethane from field deep cut extraction plants, which is currently royalty liable, but for which there is no liquid royalty prescribed, the Alberta Government will introduce a royalty on liquid ethane. As with all royalties, the government may elect to take the royalty in kind.

The Alberta Government wishes to have further consultation with the industries affected concerning the policy and the procedures for implementing the policy.

For this reason the Alberta Government will request the ERCB to inquire into the following specific matters:

1. The determination of the ethane facilities which should be affected by or be part of this policy.
2. The principles that should be used in determining the threshold volumes and the actual volumes thereby determined.
3. The determination of the procedures for requiring and the mechanism for ensuring re-injection or supply of ethane to the straddle plant system.
4. Procedures that should be used for the expedient regulatory processing of applications for field ethane extraction facilities.
5. The existing and potential efficiency of ethane extraction at the straddle plants, the investment required to enhance extraction and potential linkages with threshold volumes.
6. Any legislative changes required to implement the policy.
7. Any other relevant matters.

APPENDIX 1B THE DOWLING LETTERS

- Letter dated 17 September 1975 from the Project proponents to The Honourable R. W. Dowling, Minister of Business Development and Tourism.
- Letter dated 19 September 1975 from The Honourable R. W. Dowling to the Project proponents.
- Letter dated 26 April 1976 from the Project proponents to The Honourable R. W. Dowling.
- Letter dated 11 May 1976 from The Honourable R. W. Dowling to the Project proponents.

DOW CHEMICAL OF CANADA, LIMITED
DOME PETROLEUM LIMITED
THE ALBERTA GAS ETHYLENE COMPANY LIMITED
THE ALBERTA GAS TRUNK LINE COMPANY LIMITED

September 17th, 1975.

Honourable R. W. Dowling,
Minister of Business Development
and Tourism,
228 Legislative Building,
Edmonton, Alberta.
TSK 2B6

Dear Sir:

The purpose of this letter is

- (a) to set forth the intention and undertakings of The Alberta Gas Ethylene Company Limited (AGE), The Alberta Gas Trunk Line Company Limited (AGTL), Dow Chemical of Canada, Limited (Dow) and Dome Petroleum Limited (Dome); and
- (b) to request certain commitments from the government of Alberta

all with respect to the development of the petrochemical project described in this letter.

Dome and AGE intend to negotiate for the expansion or the construction of the following straddle plants for the economic recovery of ethane:

<u>Straddle Plant Location</u>	<u>Plant Owner</u>	<u>Ethane Volume Barrels Per Day (Approx.)</u>
Empress	Dome/PanCanadian Petroleum Limited	30,000
Empress	Pacific Petroleums Ltd.	33,000

Cochrane	Alberta Natural Gas Co. Ltd.	27,000
Edmonton	Dome/Canadian Utilities Limited	<u>20,000</u>
	TOTAL	<u>110,000</u>

Should any of the Plant Owners be unwilling to proceed with an ethane extraction plant forthwith, then Dome and AGTL jointly will proceed with the design and construction of such ethane extraction plant and in such event will offer to the Alberta Energy Company (AEC) a one-third interest in such plant.

All of the said straddle plants will sell ethane on a cost of service basis. As used in this letter, the phrase "cost of service" will be calculated on a formula similar to the cost of service formula now used by The Alberta Gas Trunk Line Company Limited (AGTL) gas transmission system in Alberta. There will be a reasonable rate of return on the equity based on a debt to equity ratio no more favourable to the owners of the facility than 75:25.

Income taxes will be calculated on a flow through basis for a minimum period of 5 years. Thereafter, allowance may be made for deferred taxes, including amortization over the remaining life of the facility of deferred taxes not provided for during the initial period of 5 years. Capital cost allowance will be taken in such a manner as to minimize the cost of the service with depreciable assets being written off on a straight-line basis at 5% per annum.

The interest rates to be used to establish the rates of return on rate base and to calculate the income tax components

of the cost of service will be the prevailing long term rates available to the owners of the facilities at the time of construction and at the time of any subsequent refinancing.

Dow and Dome undertake to sell at the market prices prevailing at the time of such sale the volumes of natural gas that are necessary to provide to TransCanada Pipelines Limited the BTU's removed below 1,000 BTU/Cubic Foot at Empress as a result of the ethane extraction referred to above.

Dome and AGTL undertake to construct and operate on the said cost of service basis within Alberta the necessary ethane gathering and storage facilities to carry ethane from the said straddle plants to ethylene plants or the Cochin pipeline as the case may be. Dome and AGTL undertake to offer to AEC an interest of not less than one-third of their interest in the said gathering and storage facilities on terms no less favourable than those on which they hold their interests.

AGE undertakes to build the first ethylene plant having a capacity of 1.2 billion pounds per year using the said ethane as a feedstock with an estimated completion date of the said plant on or about July 1, 1978 and undertakes to sell ethylene on the said cost of service basis. AGE also undertakes to build and operate on the said cost of service basis a distribution and storage system to carry the ethylene to petrochemical plants using ethylene as a feedstock or to the Cochin pipeline as the case may be. A second ethylene plant based on ethane will be scheduled for completion as

soon as practicable after the first ethylene plant. If AGE does not so proceed with the second ethylene plant, Dome and Dow shall have the right to construct the second plant. The cost of ethylene from all ethane based ethylene plants shall be equal.

Dow and Dome undertake to construct the Cochin pipeline which will carry ethane or ethylene from Alberta to markets in other places in Canada or the United States. Dow and Dome undertake to offer the owners of the ethane extraction plants in proportion to each plant's production capabilities an interest of up to 25% in the said pipeline on terms no less favourable than the interests held by Dow and Dome. In addition, Dow and Dome will offer to AEC an interest of up to 25% in the said pipeline upon the same terms.

Dome will purchase from AGE for delivery at the western terminus of the Cochin pipeline ethane which is surplus to the requirements of the ethylene plants. The price of ethane delivered to AGE's ethylene plants and to the western terminus of the Cochin pipeline will be an average price based on the prices of all extracted ethane as defined above plus an average cost of service of ethane gathering and storage. Ethane sold to Dome for removal from Alberta will be transported in the Cochin pipeline and sold to Columbia LNG Corporation (Columbia) at the commodity price under the Dome/Columbia agreement or to other fuel markets outside of Alberta. The net cumulative income from the sale of ethane

to Columbia or other fuel markets outside of Alberta shall be distributed as follows:

- 50% to the owners of the Cochin pipeline in proportion to their respective share of the ethane shipping agreements
- 20% to owners of the ethane extraction plants in proportion to their respective share of ethane production
- 30% to AGE to be applied against its cost of ethane for ethylene manufacture.

Dow undertakes to purchase from the first ethylene plant 700 million pounds per year of ethylene to be used in Alberta as follows:

- (a) 350 million pounds per year to manufacture 700 million pounds per year of vinyl chloride monomer. Dow will build additional chlorine-caustic plant capacity to provide the chlorine required to make the vinyl chloride monomer. Dow proposes to locate the vinyl chloride monomer plant and the chlorine-caustic plant at Fort Saskatchewan.
- (b) 350 million pounds per year in a styrene plant to be built by Dow and an ethylene oxide plant to be built by Dow.

Dow also undertakes to purchase 500 million pounds per year of ethylene from AGE from the first ethylene plant for use in the manufacture of additional derivatives within Alberta, for use in Eastern Canada or sale by Dow to export markets in the U.S.A.

Dow undertakes to close down its ethylene manufacturing plant in Sarnia, which has the capacity to produce 110 million pounds per year of ethylene as soon as at least 110 million pounds per year of ethylene is available to Dow from shipments through the Cochin pipeline.

With respect to ethylene produced from the second ethane based ethylene plant Dow will have the first option to use up to 300 million pounds per year of ethylene for manufacture of derivatives in Alberta. Other persons and Dow may on or before January 1, 1977 elect to commit on a firm take or pay basis to take said ethylene for use in the manufacture of derivatives within Alberta providing AGE or Dow and Dome have given the Government of Alberta substantial undertakings by January 1, 1977 that construction of the second ethylene plant will commence within six months after January 1, 1977. In the event that such undertakings are not given by AGE or Dow and Dome by January 1, 1977, then the date for commitment by other persons to take ethylene will be extended for a further period of 90 days after such undertakings are given. To the extent that, after deliveries for said commitments by other persons or Dow there remains ethylene from the second ethylene plant, Dow and Dome will commit that said remainder will be removed from Alberta through Cochin pipeline. Dow will take delivery of up to 300 million pounds per year of said remainder in Eastern Canada, provided that the total ethylene from the first and second ethylene plants taken by Dow to Eastern Canada does not exceed 500 million pounds per year, and the balance of the remainder will be sold by Dow

and Dome to export markets in the U.S.A. The Government or AGE may upon two years notice given after the start of production from the second ethylene plant withdraw for use in the manufacture of derivatives within Alberta 100 million pounds per year of ethylene and the Government or AGE may upon 4 years notice given after the start of production from the second ethylene plant withdraw for use in the manufacture of derivatives within Alberta an additional 200 million pounds per year of ethylene, from that portion of the ethylene or part thereof going to export markets in the U.S.A. The Government or AGE may upon 5 years' notice to Dow, given at any time after 5 years from start of production from the second ethylene plant, withdraw for use in the manufacture of derivatives within Alberta any remaining portion of the ethylene or part thereof going to export markets in the U.S.A.

Additional ethylene plants timed to the additional requirements of the Alberta petrochemical industry, will be planned to consume the balance of the ethane supply and replace the volumes of ethylene withdrawn as above from export to U.S.A. markets. Any of the companies shall have the right to cause the manufacture of ethylene from the said ethane within the Province of Alberta if this should prove to be necessary to ensure that ethylene is available to protect existing export movements. The ethylene from such plants shall be available for use in Alberta upon the same terms and conditions as the ethylene from the second plant.

Dow undertakes not to use in Eastern Canada more than 500 million pounds per year of ethylene produced in Alberta.

Dow and AGTL or AGE with other possible owners undertake to construct and operate a plant to produce approximately 100 million gallons per year of benzene, using as feedstock approximately 30,000 Bbl per day of condensate. Benzene will be sold to Dow for use in the manufacture of styrene. Upon the request of the Government of Alberta, Dow and AGTL (or AGE) undertake to construct a world-scale liquid cracker using as feedstock raffinate from the said benzene plant, supplemented by additional condensate or other suitable material, or alternatively to make the raffinate available for this use by others on the said cost of service basis or some other mutually agreed to basis. If Dow and AGTL or AGE build the said world scale cracker, the products therefrom will be made available to users within Alberta on a cost of service basis or some other mutually agreed to basis.

All of the undertakings given herein by the various companies are subject to the conditions that the Companies are able to make the necessary financial arrangements to proceed with the proposed project and are able to obtain the necessary regulatory approvals.

The Companies are also giving the undertakings herein upon the understanding that the Government of Alberta may create a body which may acquire ownership of the ethane or ethylene and which will in turn sell it at the Government's acquisition cost (which acquisition cost will not be higher than the cost which would have been payable had the Government body not purchased ethane or ethylene) to the companies

which under this proposal would be using or transporting ethane or ethylene.

The companies intend to use the maximum practicable Canadian engineering, design, fabrication and construction content in the proposed Alberta facilities.

The undertakings are also being given upon the understanding that it is the policy of the Government of Alberta:

- (a) to ensure, except with respect to ethylene used by Dow in Eastern Canada to the extent of 500 million pounds per year herein referred to and to ethane used in fuel markets outside of Alberta, that ethane and ethylene are not shipped out of Alberta for use as petrochemical feedstocks in such a way as to impede or hinder the development of the petrochemical industry within Alberta; and
- (b) that the Government of Alberta's first priority is to have ethane extracted from the natural gas streams leaving Alberta upgraded to ethylene and thereafter further upgraded by petrochemical derivative plants, and its second priority is the conversion of ethane to ethylene for shipment out of Alberta, and its third priority is the removal of ethane from the natural gas streams and shipped out of Alberta for non-petrochemical use.

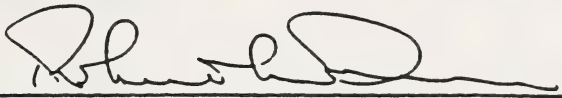
The companies jointly request confirmation from the Government of Alberta that:

- (a) It is the Government's policy to have the wellhead price of natural gas within the Province of Alberta based on a price at BTU parity with Canadian produced crude oil at the Toronto City Gate less natural gas transportation cost back to the wellhead in Alberta. The Government of Alberta recognizes that the economic competitiveness of the project is at this time primarily based on that policy. In the event that the price of Alberta natural gas goes above the said parity, the Government of Alberta, for a period of ten years from the date of start-up of the first ethylene plant, will take such action as may be required to maintain the economic competitiveness of ethylene produced by A.G.E. in Alberta.
- (b) The Government will ensure that there is available within a reasonable distance from Government approved plant sites an adequate water supply for the projects described in this letter but the Government will not be responsible for the cost of transporting the water to any plant site.
- (c) The Government will take the appropriate steps to ensure that the ethane may be extracted on reasonable terms from the gas streams now leaving Alberta.

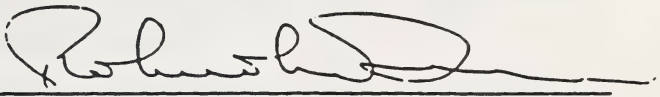
In addition, Dow requests confirmation from the Government of Alberta that in the event the government provides grants or subsidies to other users of ethylene produced from ethane, that Dow will be given equal treatment.

Yours truly,

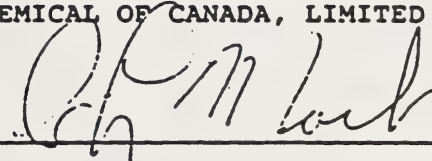
THE ALBERTA GAS TRUNK LINE COMPANY LIMITED

Per: _____

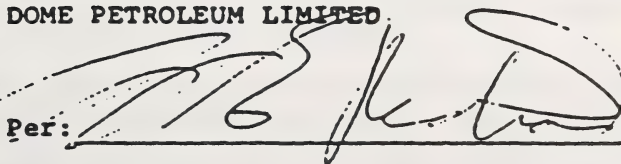
THE ALBERTA GAS ETHYLENE COMPANY LIMITED

Per: _____

DOW CHEMICAL OF CANADA, LIMITED

Per: _____

DOMO PETROLEUM LIMITED

Per: _____



BUSINESS DEVELOPMENT
AND TOURISM

403/427-3162

Office of
the Minister

228 Legislative Building
Edmonton, Alberta, Canada

TSK 286

September 19, 1975

DOW CHEMICAL OF CANADA, LIMITED
DOME PETROLEUM LIMITED
THE ALBERTA GAS ETHYLENE COMPANY LIMITED
THE ALBERTA GAS TRUNK LINE COMPANY LIMITED

Dear Sirs:

We acknowledge receipt of your letter of September 17, 1975 describing your proposed petrochemical project. Based on the undertakings and intentions expressed in your letter, the Government approves the project subject to your company's complying with all of the applicable Provincial statutes and regulations, and obtaining the necessary approvals from Provincial regulatory bodies.

In accordance with your request, the Government of Alberta confirms that:

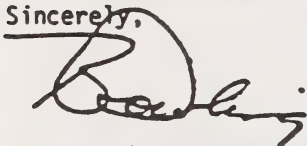
- (a) It is the Government's policy to have the wellhead price of natural gas within the Province of Alberta based on a price at BTU parity with Canadian produced crude oil at the Toronto City Gate less natural gas transportation cost back to the wellhead in Alberta. The Government of Alberta recognizes that the economic competitiveness of the project is at this time primarily based on that policy. In the event that the price of Alberta natural gas goes above the said parity, the Government of Alberta, for a period of ten years from the date of start-up of the first ethylene plant, will take such action as may be required to maintain the economic competitiveness of ethylene produced by A.G.E. in Alberta.
- (b) The Government will ensure that there is available within a reasonable distance from Government approved plant sites an adequate water supply for the projects described in this letter but the Government will not be responsible for the cost of transporting the water to any plant site.
- (c) The Government will take the appropriate steps to ensure that the ethane may be extracted on reasonable terms from the gas streams now leaving Alberta.

DOW CHEMICAL OF CANADA, LIMITED
DOME PETROLEUM LIMITED
THE ALBERTA GAS ETHYLENE COMPANY LIMITED
THE ALBERTA GAS TRUNK LINE COMPANY LIMITED

Sept. 19, 1975

In addition, the Government of Alberta confirms that in the event it provides grants or subsidies to other users of ethylene produced from ethane, that Dow Chemical of Canada Limited will be given equal treatment.

Sincerely,

A handwritten signature in dark ink, appearing to read 'R. W. Dowling', written over a horizontal line.

R. W. Dowling

DOW CHEMICAL OF CANADA, LIMITED
DOME PETROLEUM LIMITED
THE ALBERTA GAS ETHYLENE COMPANY LTD.
THE ALBERTA GAS TRUNK LINE COMPANY LIMITED

April 26, 1976

Honorable R. W. Dowling
Minister of Business Development
and Tourism
228 Legislative Building
EDMONTON, Alberta
T5K 2B6

Dear Sir:

Pursuant to our discussions of March 25, 1976, the purpose of this letter is to amend the intentions, undertakings and commitments set forth in our letter to you of September 17, 1975, and your letter to us of September 19, 1975. These amendments involve changes in wording of the September 17, 1975 letter.

1. The requirements and sources of ethane are set out in the table at the bottom of page 1 and top of page 2 of the letter of September 17, 1975. We would add at the bottom of this table the following:

"The initial requirements of ethane will be 75,000 barrels per day and will be produced from some or all of the plants referred to in the above table as determined by Dome and AGE. Additional capacity to produce ethane in excess of this initial requirement will be constructed as the project may require."

2. Add the following sentence to the first complete paragraph on page 3 (line 10):

"Dow and Dome understand that the Government of Alberta, for this specific project, will authorize the removal from Alberta of such additional volumes of gas as would be necessary to compensate for BTU'S removed below 1,000 BTU'S per cubic foot subject only to such additional volumes of gas being found surplus to Alberta's present and future requirements by the Energy Resources Conservation Board."

3. Change the date "July 1, 1978" in the fourth line of the last paragraph on page 3 to:

"December 31, 1978."

Also, in the fifth line of the last paragraph on page 3 delete:

"AGE also undertakes to"

and substitute therefor the following:

"AGE and Dow also undertake that one or both of them will...".

4. Add the following sentence immediately after the sentence which ends in the first line of page 4:

"The ethane required for the second ethylene plant will be derived from an expansion of the ethane straddle plants above the initial capacity of approximately 75,000 barrels per day from the sources described above or any other available sources. In the event that there is a shortfall of ethane after construction of the additional facilities, the shortfall volume will be made available by a reduction of the amount of ethane being shipped through the Cochin pipeline."

5. Revise the first sentence in subparagraph (a) on page 5 to read:

"400 to 450 million pounds per year to manufacture 700 million pounds per year of vinyl chloride monomer and 150 to 300 million pounds per year of ethylene dichloride."

6. Add the following words at the end of second sentence in subparagraph (a) on page 5:

"and ethylene dichloride".

7. Amend subparagraph (b) on page 5 to read as follows:

"(b) 300 million pounds per year in an ethylene oxide plant to be built by Dow".

8. Delete first full paragraph on page 8 which reads as follows:

"Dow and AGTL or AGE with other possible owners undertake to construct and operate a plant to produce approximately 100 million gallons per year of benzene, using a feedstock approximately 30,000 Bbl per day of condensate. Benzene will be sold to Dow for use in the manufacture of styrene. Upon the request of the Government of Alberta, Dow and AGTL (or AGE) undertake to construct a world-scale liquid cracker using as feedstock raffinate from the said benzene plant, supplemented by additional condensate of other suitable material, or alternatively to make the raffinate available for this use by others on the said cost of service basis or some other mutually agreed to basis. If Dow and AGTL or AGE build the said world-scale cracker, the products therefrom will be made available to users within Alberta on a cost of service basis or some other mutually agreed to basis".

Would you please confirm your agreement to the above.

Yours truly,

THE ALBERTA GAS TRUNK LINE COMPANY LIMITED

PER: 

THE ALBERTA GAS ETHYLENE COMPANY LTD.

PER: 

DOW CHEMICAL OF CANADA, LIMITED

PER: 

DOME PETROLEUM LIMITED

 PER: 



BUSINESS DEVELOPMENT
AND TOURISM

Office of
the Minister

403/427-3162

228 Legislative Building
Edmonton, Alberta, Canada

T5K 2B6

May 11, 1976

Dow Chemical of Canada Limited
Dome Petroleum Limited
The Alberta Gas Ethylene Company Limited
The Alberta Gas Trunk Line Company Limited

Gentlemen:

We acknowledge receipt of your letter of April 26, 1976.
The Government of Alberta agrees with the amendments to the
letter agreement of September 17, 1975, as set out in your
letter of April 26, 1976, and the understanding of Dow and
Dome with respect to the authorization by the Government of
the removal of additional surplus volumes of gas to compensate
for BTU reduction caused by ethane recovery in Alberta.

Yours truly,

R. W. Dowling

1. The first part of the paper discusses the importance of the study.

2. The second part of the paper discusses the methodology used.

3. The third part of the paper discusses the results of the study.

4. The fourth part of the paper discusses the conclusions of the study.

5. The fifth part of the paper discusses the implications of the study.

6. The sixth part of the paper discusses the limitations of the study.

7. The seventh part of the paper discusses the future research.

8. The eighth part of the paper discusses the acknowledgments.

9. The ninth part of the paper discusses the references.

APPENDIX 1C THE PLANCHE LETTERS

- Letter dated 16 December 1985 from the Project proponents to The Honourable H. Planche, Minister of Economic Development.
- Letter dated 30 December 1985 from The Honourable H. Planche to the Project proponents.

DOME PETROLEUM LIMITED
DOW CHEMICAL CANADA INC.
NOVA, AN ALBERTA CORPORATION
THE ALBERTA GAS ETHYLENE COMPANY LTD.

December 16, 1985

The Honourable H. Planche
Minister, Economic Development
Government of Alberta
Room 320, Legislative Building
EDMONTON, AB

Dear Sir:

Re: Alberta Ethane/Ethylene Petrochemical Project
Letter of Intention & Undertakings dated September 17, 1975

This letter is further to communications amongst representatives of our Companies and officials of the Department of Economic Development respecting the impending loss of the Columbia LNG Corporation contract for the sale of project ethane, the major impact this will have on the operation and viability of the Cochin pipeline system and the resultant effect this will have on the Alberta ethylene petrochemical project and Alberta natural gas producer interests.

Our Companies have been seeking alternative ethane markets to replace, at least in part, the Columbia LNG Corporation contract and minimize the impact of the loss of this market on the Cochin pipeline system and the Alberta ethylene petrochemical project. In seeking alternative markets, we have established the following criteria as conditions for any sale to a petrochemical market outside Alberta:

1. any such sale will proceed only if it will impose no material negative impact to the existing or prospective Alberta ethylene or ethylene derivative industries;
2. any such sale will only be of a short to medium term duration and will be subject to recall for use in any installed Alberta petrochemical facility;
3. any such sale will be to supply only existing capacity and will not be to supply expansions or new capacity additions;
and

4. any such sale will be concluded only where viable alternatives are available to the potential purchaser and where the terms of any such sale are competitive with such alternatives, and provided further that the price to the potential purchaser shall not be less than the cost of ethane purchased from the project's extraction system.

We believe these criteria are consistent with the intentions and undertakings of our Companies as expressed in the September 17, 1975 letter. We would appreciate your early response to this initiative being undertaken by the project to respond to the current urgent and difficult circumstances of the Cochin pipeline system.

Yours truly,

DOME PETROLEUM LIMITED

Per: 

DOW CHEMICAL CANADA INC.

Per: _____

NOVA, AN ALBERTA CORPORATION

Per: _____

THE ALBERTA GAS ETHYLENE COMPANY LTD.

Per: 



ECONOMIC DEVELOPMENT

320 Legislature Building, Edmonton, Alberta, Canada T5K 2B6 403/427-2134

30 Dec 85

Dome Petroleum Limited
Dow Chemical Canada Inc.
Nova, An Alberta Corporation
The Alberta Gas Ethylene Company Ltd.

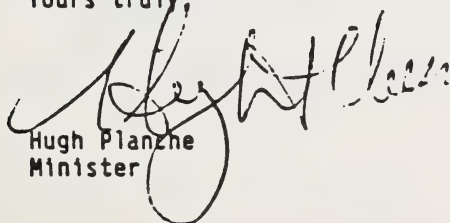
Dear Sirs:

This is in response to your letter of December 16, 1985 requesting my comments on your proposal to sell ethane into petrochemical markets outside of Alberta.

Firstly, it is understood that the undertakings contained in a September 17, 1975 letter from Dow Chemical of Canada Ltd., Dome Petroleum Ltd., the Alberta Gas Ethylene Co. Ltd., and the Alberta Gas Trunk Line Company Ltd. to the then Minister of Business Development and Tourism, The Honourable R.W. Dowling, continue in force.

Secondly, to the extent that the parties to these undertakings are now proposing to sell ethane for use as petrochemical feedstock under the terms indicated in your December 16th letter to me, it is my perception that such sales conform with the original undertakings and, as such, I have no objection to such sales taking place.

Yours truly,



Hugh Planzhe
Minister

APPENDIX 2 LIST OF INQUIRY PARTICIPANTS

Principals and Representatives

The Alberta Gas Ethylene Company Ltd.
 H. D. Williamson
 F. R. Foran, Q.C.

The Ethylene Derivative Industry:
 Union Carbide Ethylene Oxide/Glycol
 Company (Union Carbide)
 Dow Chemical Canada Inc. (Dow)
 C-I-L Inc. (C-I-L)
 Celanese Canada Inc. (Celanese)
 Novacor Chemicals Ltd. (Novacor)
 R. A. Neufeld

The Straddle Plant Owners:
 Dome Petroleum Limited (Dome)
 PanCanadian Petroleum Limited
 (PanCanadian)
 Petro-Canada Inc. (Petro-Canada)
 D. M. Wolcott and Associates Ltd.
 D. A. Holgate

Alberta Natural Gas Company Ltd
 M. A. Putnam, Q.C.

Witnesses

J. H. Butler, P.Eng.
 Dr. J. E. Feick
 D. J. McConaghy
 C. L. Mort
 (of C. L. Mort
 Consulting Inc.)
 R. L. Pierce
 Dr. W. A. Langford
 (of NOVA, An Alberta
 Corporation)

D. Center
 Dr. T. R. Jones
 (both of Union Carbide)
 W. McCagherty
 G. Telmer
 (both of Dow)
 G. Clarke
 (of C-I-L)
 Dr. I. Brownlie
 (of Celanese)
 D. Ferris, P.Eng.
 (of Novacor)

D. G. Ramsden-Wood
 (of Dome)
 W. C. Reinwart
 (of PanCanadian)
 T. H. Skupa, P.Eng.
 (of Petro-Canada)
 G. E. Handwerk, P.Eng.
 (independent consultant)
 F. J. VanGinhoven, P.Eng
 R. A. Raidt, Professional
 Engineer registered in
 the State of Texas
 (both of Fluor Canada
 Ltd.)

W. S. Chmilar, P.Eng.
 D. A. Sharp, P.Eng.
 J. A. Smith

Principles and Representatives

Cochin Ethane Marketing Joint Venture
W. J. Hope-Ross

The Ethane Owners Group:
Amerada Mineral Corporation of Canada Ltd.,
Anderson Exploration Ltd.
Canadian Hunter Exploration Ltd.
(Cdn. Hunter)
Canterra Energy Ltd.
Chevron Canada Resources Limited (Chevron)
Conoco Canada Limited
Esso Resources Canada Limited (Esso)
Gulf Canada Resources Limited (Gulf)
Home Oil Company Limited
Mobil Oil Canada, Ltd. (Mobil)
Norcen Energy Resources Limited
Shell Canada Limited
Sulpetro Limited (Sulpetro)
Texaco Canada Resources (Texaco)
Unocal Canada Limited
D. G. Hart, Q.C.
R. C. Muir
D. G. Davies

Amoco Canada Petroleum Company Ltd.
D. G. Arnason, P.Eng.
R. Wingfield, P.Eng.

Anderson Exploration Ltd.
A. H. Williamson, P.Eng.

Canadian Hunter Exploration Ltd.
J. F. Mackie

Witnesses

D. G. Ramsden-Wood
W. R. Weaver
(both of Dome)

M. Bregazzi
(of Gulf)
C. J. Caffrey, P.Eng.
(of Mobil)
J. A. Dillabough, P.Eng.
(of Cdn. Hunter)
N. H. Eggen, P.Eng.
(of Texaco)
G. M. Engbloom, P.Eng.
(of Confer Consulting
Limited)
B. C. Fleming
(of Cdn. Hunter)
Dr. K. E. Godard, P.Eng.
(of Chevron)
R. V. Gooden, P.Eng.
(of Texaco)
Dr. D. J. Hawkins, P.Eng.
(of Hycarb Engineering
Ltd.)
D. J. Henry
(of Esso)
W. D. Onn
(independent consultant)
Dr. J. P. Sutherland
(of J. P. Sutherland and
Associates)
J. D. Wilkinson, Professional
Engineer registered in the
State of Texas
(of Ortloff Engineers, Ltd.)
R. J. Zaharko, P.Eng.
(of Sulpetro)

R. B. Arnold, P.Eng.

Principles and Representatives

Canterra Energy Ltd.
R. C. Muir

Chevron Canada Resources Limited
B. K. O'Ferrall
R. A. Pashelka

Conoco Canada Limited
R. E. Pelzer
B. E. Schellenberg, P.Eng.

Esso Resources Canada Limited
D. G. Hart, Q.C.

Gulf Canada Resources Limited
D. G. Davies

Home Oil Company Limited
C. A. Keck
B. Peterson

Mobil Oil Canada, Ltd.
D. Bews

Norcen Energy Resources Limited
D. G. Davies

Poco Petroleums Ltd.
P. J. McIntyre
B. Brander

Shell Canada Limited
R. W. Riegert

Sulpetro Limited
P. H. Forrest
R. J. Zaharko, P.Eng.

Texaco Canada Resources
J. I. Parker

Independent Petroleum Association of Canada
A. S. Hollingsworth
J. Snider

Witnesses

R. A. Park, P.Eng.
Dr. K. E. Godard, P.Eng.
W. H. Armstrong, P.Eng.
R. M. Shaunessy, P.Eng.

R. P. Cej, P.Eng.
J.W.F. Klein, P.Eng.
J. M. Wakim
S. G. McDonald, P.Eng.

R. B. Hillary
H. M. Sorensen, P.Eng.

Principles and RepresentativesWitnesses

ProGas Limited

N. Boutillier

L. Clarke

Western Gas Marketing Limited

D. McLean

Pan-Alberta Gas Ltd.

D. Dawson

City of Red Deer

A. Scott

A. Scott

Energy Resources Conservation Board staff

M. J. Bruni

G. Habib

B. C. Hubbard, P.Eng.

Dr. F. Rahnama

W. J. Schnitzler, P.Eng.

APPENDIX 3 SUMMARY OF VIEWS OF INQUIRY PARTICIPANTS

This summary is provided as a convenience to readers of the report. It is a general overview of the positions of the participants in the inquiry on the major issues and sub-issues. It is not intended to be an exhaustive review nor to be totally complete. Note that the Board's views, findings, and recommendations contained in this report are based on the evidence presented at the inquiry and not on this summary.

Also for the reader's convenience the abbreviations used in this appendix are reproduced below:

AEGS	Alberta Ethane Gathering System
AGE I and II	Alberta Gas Ethylene's First and Second Ethylene Plants
AGE III	Alberta Gas Ethylene's Proposed Third Ethylene Plant
AGEC	Alberta Gas Ethylene Company Ltd.
Amoco	Amoco Canada Petroleum Company Ltd.
ANG	Alberta Natural Gas Company Ltd
bbl	barrels
bbl/d	barrels per day
CEMJV	Cochin Ethane Marketing Joint Venture
Chevron	Chevron Canada Resources Limited
EDI	Ethylene Derivative Industry
EOG	Ethane Owners Group
ERCB	Energy Resources Conservation Board
IPAC	Independent Petroleum Association of Canada
m ³	cubic metres
m ³ /d	cubic metres per day
Norcen	Norcen Energy Resources Limited
NOVA	NOVA, An Alberta Corporation
Project	Alberta Ethane/Ethylene Petrochemical Project
Shell	Shell Canada Limited
SPO	Straddle Plant Owners
Union Carbide	Union Carbide Ethylene Oxide/Glycol Company

ISSUE NUMBER 1: THE DETERMINATION OF ETHANE FACILITIES WHICH SHOULD BE PROTECTED BY OR BE PART OF THE POLICY

SUB-ISSUES	PETROCHEMICAL PROJECT	NATURAL GAS PRODUCERS
1.1 Existing upstreaming field plants.	The view of grandfathering of approved capacity, recovery factor, and gas sources was supported by AGECE, ANG, CEMJV, EDI, and SPO. SPO supported grandfathering provided an acceptable threshold level is set.	EOG rejected the grandfathering of approved capacity, recovery factor, and gas sources. Amoco and IPAC supported the idea. Chevron supported the idea provided the EOG package is not accepted in whole.
1.2 Existing non-upstreaming field plants.	The view of exempting the existing non-upstreaming field plants while no residue gas going to NOVA system was supported by AGECE, ANG, CEMJV, EDI, and SPO.	Exempting the existing non-upstreaming field plants was supported by all gas producers.
1.3 New upstreaming field plants.	New upstreaming field plants should be subject to policy. This view was supported by AGECE, ANG, CEMJV, EDI, and SPO.	The view of making new upstreaming field plants subject to the policy was supported by EOG, Amoco, Chevron, IPAC, Norcen, and Shell.
1.4 New non-upstreaming field plants.	Exempting new non-upstreaming field plants while no lean residue gas going to NOVA system was supported by AGECE, CEMJV, and SPO.	Exempting new non-upstreaming field plants was supported by Amoco, Chevron, EOG, Norcen, and Shell.
1.5 New field plants with ethane ownership retained.	New field plants which retain ownership of ethane through the straddle plants should be subject to the policy, in the view of AGECE.	While most producers did not make specific comment on this sub-issue, Shell suggested toll processing as a viable alternative to new field plants.
1.6 Existing straddle capacity.	AGECE, EDI, and SPO argued that the existing straddle capacity at today's efficiency level should be protected by policy to ensure 135 000 bbl/d (21 460 m ³ /d) of ethane now and 150 000 bbl/d (23 850 m ³ /d) later.	EOG, IPAC, Norcen, and Shell said that existing capacity should be affected by the policy but not protected.
1.7 Additional straddle capacity.	The Project stated that any additional straddle capacity that is required should be protected by the policy through upward adjustment of the threshold volume.	Chevron, EOG, Norcen, and Shell recommended that straddle plant expansions should not be protected by the policy.
1.8 Increase in straddle plant efficiency.	ANG indicated that increases in straddle plant efficiency should be protected through upward threshold volume adjustments.	Chevron, EOG, and Norcen argued for no protection of efficiency improvements through threshold volume. IPAC and Shell, however, recommended protection for some reasonable achievable efficiency level in the threshold level.
1.9 Ethylene manufacturing facilities.	AGECE, ANG, EDI, and SPO supported the protection of all existing and approved ethylene manufacturing facilities (AGE I, II, III, and debottlenecking).	EOG, IPAC, Norcen, and Shell argued for protection of AGE I and II as originally approved. Chevron indicated that the lesser of the approved capacity of AGE I and II, or their actual consumption, should be protected.
1.10 Ethylene upgrading facilities.	EDI and SPO supported protection of ethylene upgrading facilities in Alberta. EDI argued that both new and existing plants should be protected.	Chevron, EOG, IPAC, Norcen, and Shell opposed any protection for ethylene upgrading facilities other than as supplied by AGE I and II.
1.11 Ethane marketing.	AGECE, ANG, CEMJV, EDI, and SPO recommended that the volume of ethane marketed by CEMJV should be protected by the threshold volume. AGECE argued that ethylene exports should also be protected.	None of the gas producers supported the protection of ethane marketing through the threshold volume.
1.12 Duration of protection.	AGECE submitted that ethane should be protected for the Project's use for 20 years of facility life or contract life. SPO opted for no expiry of the protection while ANG recommended that protection continue at least until 2008.	Chevron, EOG, IPAC, and Norcen recommended a 5-year period of protection. EOG stated the 5-year protection should start from August 1987. Chevron said that it should start from the date when the ERCB decision is announced.

ISSUE NUMBER 2: THE PRINCIPLES THAT SHOULD BE USED IN DETERMINING THE THRESHOLD VOLUMES AND THE ACTUAL VOLUMES THEREBY DETERMINED

SUB-ISSUES	PETROCHEMICAL PROJECT	NATURAL GAS PRODUCERS
2.1 Commitment in Dowling Letters.	AGEC, ANG, EDI, and SPO submitted that a commitment was made to the Project for sufficient ethane at reasonable cost to fulfil the Project's ethane requirements.	Except for Shell, who stated that the Dowling letters gave no specific volume guarantees, other gas producers who made any remarks stated that the Dowling letters, at most, guaranteed ethane for AGE I and II.
2.2 Protection for expansion of ethylene manufacturing facilities.	See 1.9.	See 1.9.
2.3 Protection for ethane marketing volumes.	See 1.11.	See 1.11.
2.4 Protection for Cochin buffer requirements.	All Project participants recommended that this volume is required for ethylene export and should be part of the threshold volume.	EOG, IPAC, and Norcen stated that there should not be any protection for the Cochin Pipeline buffering requirements. Shell stated that there could be a minimum requirement protected by the policy for buffering purposes.
2.5 Protection for straddle plant expansion.	See 1.7.	See 1.7.
2.6 Protection for straddle plant efficiency improvements.	See 1.8.	See 1.8.
2.7 Measurement of the threshold volume at the inlets or outlets of straddle plants.	Project participants stated that the threshold volume should be measured at the outlet of the straddle system.	Chevron and Shell recommended that the threshold volume be measured at the inlet of the straddle system using a reasonable level of recovery factor. Other gas producers did not make specific comments regarding this issue.
2.8 Relate threshold volume to current demand for ethane by the Project.	AGEC, CEMJV, EDI, and SPO argued that the threshold volume level should not be related to the current demand. Threshold level should be met whether the Project is using the ethane or not. ANG stated that the threshold volume should be adjusted downward if the extracted ethane is not used by the Project.	Amoco recommended that the threshold volume should be flexible and reflect the actual Project requirements. All gas producers stated that the ethane should not be reinjected at the field if the Project is not using the ethane.
2.9 Supply risk due to low gas flows.	Except for CEMJV, who did not make any specific comments, all Project participants indicated that the Project accepted the risk of low gas flows due to deliverability problems and market demand.	EOG argued that shortfall of ethane due to low gas flow is a normal business risk that should be assumed by the Project. Shell and Norcen also supported the EOG position.
2.10 Supply risk due to low ethane content of gas flow caused naturally.	Except for CEMJV, who did not make specific comments on this issue, all Project participants submitted that they accepted the risk associated with natural fluctuations in gas inlet composition.	EOG said that a shortfall of ethane due to a natural low ethane content of the gas streams reaching the straddle system is a normal business risk that the Project was aware of at the time of plant construction.
2.11 Supply risk due to low ethane content caused by field plant upstreaming.	AGEC indicated that it was aware of the technical possibility of field plants extracting ethane upstream of the straddle system but did not believe the Government would allow it to be a major risk to the Project.	Chevron, EOG, and Norcen said that this issue is the main reason for the policy.

SUB-ISSUES	PETROCHEMICAL PROJECT	NATURAL GAS PRODUCERS
2.12 Expiry of threshold volume.	See 1.12.	See 1.12.
2.13 Recommended near-term threshold volume.	AGEC recommended that the threshold level should initially be set at 135 000 bbl/d (21 460 m ³ /d). This volume is the sum of 95 000 bbl/d (15 100 m ³ /d) for Joffre plants and 40 000 bbl/d (6 360 m ³ /d) to be marketed by CEMJV. CEMJV, EDI, and SPO concurred with AGECE in this regard.	With some minor variations, all gas producers recommended a short-term level of threshold volume equal to the original design capacity of AGE I and II, which is about 75 000 bbl/d (11 925 m ³ /d).
2.14 Recommended long-term threshold level.	AGEC recommended that after 1993, when debottlenecking and the third ethylene plant are complete, the threshold level should increase to 150 000 bbl/d (23 850 m ³ /d). With the exception of ANG, who did not make any comments, other Project participants agreed with AGECE's recommendation.	Gas producers suggested that after 5 years the threshold volume and the Project's protection under the policy should expire. In the long run, free markets should prevail for both feedstock and product sales.

ISSUE NUMBER 3: THE DETERMINATION OF THE PROCEDURES FOR REQUIRING AND THE MECHANISM FOR ENSURING REINJECTION OR SUPPLY OF ETHANE TO STRADDLE PLANT SYSTEM

SUB-ISSUES	PETROCHEMICAL PROJECT	NATURAL GAS PRODUCERS
3.1 Priority of obligation to restore threshold volume.	In case of ethane shortfall from the set level of the threshold volume, AGECE recommended the last field plant built in Alberta should be the first plant to supply or reinject the ethane for restoring the threshold level. AGECE submitted that the royalty ethane from a new plant should be taken before the producer's share. SPO concurred with AGECE's recommendation. ANG suggested that field plants should supply or reinject ethane on a prorated basis.	Gas producers stated that royalty ethane should be used before taking producer ethane. Their specific prioritizations are summarized below: Amoco: (1) royalty from new field plants, (2) non-royalty from new field plants, (3) royalty ethane from other plants. Chevron/Shell: (1) royalty ethane, (2) open market, (3) producer's ethane. EOG/IPAC: (1) open market, (2) royalty ethane, (3) producer's ethane. Norcen: (1) curtail export, (2) royalty ethane, (3) producer's ethane. All disagreed with last-built first-to-reinject concept.
3.2 Reinjection vs. supply in kind to restore threshold volume.	AGECE stated that it prefers the reinjection of ethane or by-passing at field plants. It argued that supply in kind may be constrained by unsuitability of ethane for AGE feedstock. ANG also rejected supply in kind because it is only possible for a few field plants. SPO submitted that it also prefers reinjection because supply in kind would affect its cost-of-service structure, unless the volume supplied in kind is "deemed" to have been produced at the straddle plants to maintain the ethane share of operating costs. AGECE concurred with the deeming concept proposed by SPO.	Chevron, IPAC, and Shell suggested that the option be left open to the ethane owner. EOG stated that, if practical, supply in kind be used; otherwise reinject ethane at the field plant gate.
3.3 Price of ethane provided to restore threshold volume.	AGECE recommended that the ethane reinjected to restore the threshold volume should be priced at its shrinkage value. The ethane provided in kind, however, should receive shrinkage value plus incremental cost of extraction at the straddle system. ANG, CEMJV, and EDI did not comment on this issue. SPO, however, agreed with AGECE's recommendation.	Amoco recommended that the price for ethane provided to restore the threshold should be on the basis of actual extraction and reinjection costs. Other gas producers recommended that the ethane be priced at its fair market value.
3.4 Price of other liquids accompanying ethane.	AGECE argued that propane-plus liquids reinjected with ethane should receive a shrinkage value as price. However, if these liquids are supplied in kind, they will receive their commodity value. SPO stated that the accompanying liquids should be treated the same as ethane.	Chevron suggested that the accompanying liquids should be returned to the producer in a manner satisfactory to him. Shell stated that payments for accompanying liquids should be deemed as a credit toward royalties payable, using contract prices.
3.5 Reinject volume necessary to restore threshold volume.	AGECE estimated that 6.25 per cent of the reinjected ethane would not reach the straddle system. Therefore, sufficient ethane should be provided to restore the threshold level at the outlet of the straddle system. SPO argued that, for each barrel reinjected in the field, approximately 85 per cent will be recovered at Empress and 100 per cent would be recovered at Cochrane.	IPAC argued that it is inequitable to inject more ethane than can be recovered at the straddle plants. EOG argued that a mechanism to supply deficient volumes should be based on maximum recovery of ethane in the province.
3.6 Maintenance of threshold level.	See 2.9.	See 2.9.

SUB-ISSUES	PETROCHEMICAL PROJECT	NATURAL GAS PRODUCERS
<p>3.7 Administration of reinjection requirements.</p>	<p>AGEC recommended that the Board should forecast, on an annual basis, the straddle system ethane availability to assess the likelihood of reinjection. The annual threshold volume would then be converted to monthly entitlements based on expected seasonal variation in gas throughputs. AGEC also recommended that the Board monitor daily the ethane availability to determine if reinjection is necessary. Underages or overages should be adjusted in the following month. The overage will be stored by the straddle system for 1 month at a cost to field plant producers. If the overage is not used within the following month, it will be disposed of by CEMJV. ANG suggested that the Board should direct a body or agency to administer the reinjection requirements and that NOVA or AEGS could be involved through their existing monitoring facilities. EDI also recommended that the Board should be legally authorized to administer the reinjection requirements. After implementation of the policy through legislation, the Board should set a task force to work out the details. Both CEMJV and SPO concurred with AGEC's recommendations.</p>	<p>Chevron recommended that if the royalty ethane is not sufficient to restore the threshold level, the following steps should be taken:</p> <ol style="list-style-type: none"> 1. The Project provides a forecast of potential ethane prior to 1 October of each year to ERCB, showing shortfall. Also, evidence should be required to show that the shortfall cannot be made up through improvements in the recovery efficiency or system optimization or by contracting or for additional volume. 2. ERCB will hold meeting with affected parties if the request for reinjection is legitimate. 3. Field plant producers will decide among themselves which plants should provide the ethane to the system. If they do not agree by 1 December, ERCB will devise a suitable method to achieve this goal. 4. Comparison of actual ethane supply and forecast will be made by 1 February of the following year. If actual supply exceeded the forecast, then ethane in kind or fair market value of the ethane must be returned to the gas producer who reinjected the ethane, or the volume of ethane reinjected must be carried forward to make up possible shortfall in the current year. If actual supply were less than forecast, then a reverse procedure would be followed. <p>EOG also recommended a similar procedure. It suggested that:</p> <ol style="list-style-type: none"> 1. Based on the previous year's system performance, AGEC would provide a forecast of supply for the current year. 2. If insufficient, regulatory authority would provide a detailed supply-demand forecast for ethane for the current year. 3. Only deficient volumes in the forecast year would be provided. Gas producers will offer ethane at a negotiated price. 4. If insufficient, then royalty ethane should be used; if still insufficient, ethane should be provided in lieu of royalty on other gas components; if further volumes needed, ethane would be provided at owner's opportunity cost. 5. 90-day notice will be given for deficiencies. 6. In a year when deficient volumes are forecast, excess ethane volumes delivered would be a credit to future supply of deficient volumes.
<p>3.8 Necessary period of notice of reinjection.</p>	<p>AGEC recommended 1-day notice and with some indication of expected duration of reinjection period. SPO concurred with AGEC.</p>	<p>EOG, Norcen, and Amoco recommended that ample notice, 60-90 days, be given for deficient volume deliveries and deficiencies be determined on an annual basis.</p>

ISSUE NUMBER 4: PROCEDURES THAT SHOULD BE USED FOR THE EXPEDIENT REGULATORY PROCESSING
OF APPLICATIONS FOR FIELD ETHANE EXTRACTION FACILITIES

SUB-ISSUES	PETROCHEMICAL PROJECT	NATURAL GAS PRODUCERS
4.1 Criteria for approving upstreaming applications.	SPO, ANG, and CEMJV recommended no change to the Board's past procedures for evaluating ethane extraction applications. AGECE suggested that there be a public interest test.	Applications for ethane extraction facilities should be handled in the same manner as other applications for removing gas liquids. All information required should be on a plant-only basis.
4.2 Public scrutiny of upstreaming applications.	There was general agreement that notice be given and that a hearing be held only if objections were received. SPO and CEMJV suggested notice be given only if the Board determined there might be an adverse impact on someone.	After the policy is implemented, publishing notice of the application should be sufficient for most cases. A hearing would be held only if contentious issues were identified. Such issues would not include any impact of upstreaming on the Project once the threshold volume was set.

ISSUE NUMBER 5: THE EXISTING AND POTENTIAL EFFICIENCY OF ETHANE EXTRACTION AT THE STRADDLE PLANTS,
THE INVESTMENT REQUIRED TO ENHANCE EXTRACTION AND POTENTIAL LINKAGES WITH THRESHOLD VOLUMES

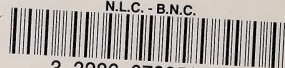
SUB-ISSUES	PETROCHEMICAL PROJECT	NATURAL GAS PRODUCERS
5.1 Current efficiency - input/output plots.	The input/output plots show that recovery efficiency decreases at the straddle plants as ethane is removed from the inlet gas because of field plants. Outlet ethane decreases as inlet ethane decreases but not as rapidly. For a given inlet ethane concentration, the outlet concentration is less with lower gas throughputs.	EOG disagreed with the validity of the input/output plots and the conclusions of the Handwerk study. In its opinion, based on other studies, the ethane recovery efficiency remains roughly constant over a wide range of inlet concentrations at the Empress plants.
5.2 Current efficiency - actual operation.	Efficiency is affected by operating mode relating to gas throughput; for example, use of Joule-Thompson valve, or use of one stage of expander rather than two stages. ANG pointed out its recovery efficiency is 87 per cent.	Stated that the current efficiency of the straddle plant system is lower than that of the newer field plants.
5.3 CO ₂ specification in ethane.	Maximum of 2.5 per cent CO ₂ permitted in product ethane. This specification lowers ethane recovery at Dome I and II plants. For example, increasing CO ₂ in product from 5 to 6 per cent would increase ethane recovery by 2.5 per cent. ANG has a CO ₂ removal unit in place.	No comment.
5.4 Reinjection or rejection of ethane at straddle system.	Reinjection, the preferred method to let ethane go, is ordered when there is no market for the ethane production. Other modes of operation when there is no market for ethane could be ethane rejection or by-passing of gas. Historically, no significant volumes of gas have been by-passed and the Project anticipates very little reinjection in future.	IPAC stated that field plant reinjection should not occur if the straddle plants are reinjecting/rejecting ethane. Chevron said that the straddle plants are by-passing or reinjecting ethane at significant rates which, if stored, could provide threshold volume protection for a whole year at AGECC's suggested threshold volume level.
5.5 Capacity of straddle system to process all available gas.	Some gas has been by-passed at Empress due to power failures but there are no capacity restrictions that exist. Gas containing about 5000 bbl/d (795 m ³ /d) of ethane is forecast to be by-passed at Cochrane although ANG does not expect this to occur if its approved inlet is increased.	No comment.
5.6 Potential improvements in ethane extraction efficiencies and corresponding costs.	The Handwerk report estimated \$54 x 10 ⁶ for 20 000 bbl/d (3 180 m ³ /d) additional ethane for ANG plant at Cochrane and Dome I and Petro-Canada plants at Empress. At the Petro-Canada plant, an additional 10 000 bbl/d (1 590 m ³ /d) could be achieved through increased efficiency (53.2 to 78.0%) and a one-third expansion in throughput for \$38 x 10 ⁶ . At Dome I, an additional 7 300 bbl/d (1 160 m ³ /d) could be recovered with \$12.5 x 10 ⁶ investment. ANG estimated it would cost about \$3.6 x 10 ⁶ to recover an additional 3 700 bbl/d (588 m ³ /d) ethane. Fluor Canada's report indicated that an additional 26 000 bbl/d (4 100 m ³ /d) of ethane could be recovered at three Empress plants with an investment of \$96.9 x 10 ⁶ . After adding the owner's cost, SPO indicated that total cost for these plants could reach \$115.4 x 10 ⁶ .	EOG believes there is significant scope for efficiency enhancement at Empress. Shell stated that there should be a linkage between the threshold volume and the available straddle plant ethane as an incentive to increase the straddle plant recovery efficiencies. IPAC suggested that there is technology available to permit extraction efficiencies down to less than 1% ethane remaining in the residue stream. EOG and Chevron suggested that the technology proposed by SPO to increase the efficiency of the straddle plants was not the most appropriate and that the costs appeared to be high.
5.7 Effect on threshold volume of increased efficiency.	There was unanimous agreement within the Project that any recovery efficiency improvements at the straddle plants should be protected by an increase in the threshold volume.	EOG, Chevron, and Norcen agreed there should be no linkage between the threshold volume and efficiency improvements at the straddle plants. IPAC favoured a linkage but only to a maximum of AGE I and II design capacity. Shell also favoured a linkage, saying a lower threshold volume phasing out would encourage efficiency improvements at the straddle plants.

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<p>5.8 Effect of relative straddle/field recovery efficiencies on provincial ethane supply.</p>	<p>AGEC indicated that the relative straddle plant/field plant efficiencies were irrelevant to incremental ethane recovery. SPO said the Handwerk study showed that field plants produce only marginal incremental ethane for the province because the straddle plants would have recovered 0.85 barrel at Empress or 1 barrel at Cochrane for each barrel recovered in the field. ANG said that there should be some protection for a straddle plant owner who undertakes to increase recoverable ethane in the province.</p>	<p>Chevron stated that if the implemented policy encourages efficient ethane recovery, then there will be a sufficient supply such that a method to maintain a threshold volume will never have to be implemented.</p>
<p>5.9 Capacity of Alberta Ethane Gathering System.</p>	<p>Ethane pipeline capacity constraints downstream of Cochrane have caused some ethane reinjection at Waterton and Jumping Pound. SPO indicated that additional pumping capacity on the system would rectify the problem.</p>	<p>EOG stated that supply-side matters, such as constraints in the ethane distribution or storage system, should be considered in supplying the threshold volume. IPAC noted there is insufficient capacity in the western leg of the AEGS while Shell's suggestion was that the western leg must be expanded.</p>

ISSUE NUMBER 6: ANY LEGISLATIVE CHANGES REQUIRED TO IMPLEMENT THE POLICY

SUB-ISSUES	PETROCHEMICAL PROJECT	NATURAL GAS PRODUCERS
<p>6.1 Authority to order reinjection and</p> <p>6.2 Administration of threshold volume.</p>	<p>AGEC, Union Carbide, and ANG indicated that the Oil and Gas Conservation Act and Regulations be amended to ensure the Board has the power to require reinjection of ethane and to provide for a penalty if the order is not complied with.</p>	<p>Except for IPAC and Amoco, who offered no comment, there was agreement that the Board does not currently have the right to order ethane reinjection or delivery in kind. Hence, changes to the Oil and Gas Conservation Act and Regulations would be necessary. Chevron suggested that a quasi-judicial mechanism be established to ensure fairness to affected producers. Shell and Norcen commented that legislative changes should not adversely affect ownership rights and that fair market prices should prevail for transferred ethane. Norcen added that legislative changes should reflect concern for simplicity and efficiency of administration.</p>
<p>6.3 Remove opportunity for objections on future applications.</p>	<p>Union Carbide agreed as long as the threshold volume is met. Other Project participants believed that any affected parties should continue to have the right to scrutinize applications and oppose them if necessary.</p>	<p>Chevron stated changes would be necessary to the Energy Resources Conservation Act and the Administrative Procedures Act which currently appear to make it impossible for the Board to not hold a hearing if an affected party insisted on one.</p>
<p>6.4 Ethane royalty.</p>	<p>No comment.</p>	<p>Chevron said that if only Crown royalty volumes were to be injected, then the Mines and Minerals Act on royalty regulations would have to be amended.</p>

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